Technical Paper and Addendum: Transport Model

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Investment and Regeneration Service
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1. Introduction

1.1 Kirklees Council has produced a transport model to help support the development of the Local Plan. The Local Plan is the council's strategy for growth from 2016 to 2031. The government requires all local councils to develop a long-term plan which sets out how and where land can be developed over the next 15 years, in order to meet the growing needs of local people and businesses. The plan will be used to guide development and inform planning decisions once adopted.

1.2 Due to its use as a basis for informing planning decisions, the Local Plan needs to be robust. This includes its strategies and policies being based on appropriate and credible evidence. From the perspective of transport, it is considered prudent to understand the cumulative transport impact of the Local Plan proposals on the transport network and to show how this translates into a transport strategy and potential transport improvements.

1.3 To achieve the above, Kirklees Council undertook to strategically model the transport network (highway and public transport) in order to assess the cumulative transport impact of the land use allocations in the draft Local Plan. The work identifies locations on the highway network which are forecast to suffer increased delays as a result of the proposals and therefore where the Council needs to concentrate its transport mitigation strategy. It also shows whether the mitigation strategy is able to accommodate the growth over the plan period.

1.4 This report summarises the methodology and results of the modelling study. The results of this study have been and will be used in further work to help identify potential transport improvements in the borough of Kirklees. The improvements study informs the Council's Infrastructure Delivery Plan, which forms part of the evidence base for the Local Plan.

1.5 The report includes the following information:

- Model build information;
- The methodology of the transport study;
- The assumptions used for forecasting future travel demand;
- Tests undertaken;
- A summary of the key results; and,
- Conclusions and recommendations.

1.6 In addition this report is designed to provide background to information that is contained in the draft Kirklees Local Plan - Allocations and Designations Document and the Kirklees Infrastructure Delivery Plan.

2. Model Build Information

2.1 The transport modelling study has been undertaken using the recently commissioned Kirklees Transport Model of 2015. The methodology used was based on information available in the Department for Transport's Transport Analysis Guidance (TAG).

2.2 The Transport Model operates as a five stage transport demand model and has three component parts. The five stages are:

1. **Trip generation** determines the frequency of origins or destinations of trips in pre-determined zones within the model by trip purpose, as a function of land uses and household demographics, and other socio-economic factors.
2. **Trip distribution** matches origins with destinations, using existing travel patterns as a starting point.
3. **Time of day choice** determines which trips occur in the peak hours and which in the inter-peak or off-peak.
4. **Mode choice** computes the proportion of trips between each origin and destination that use a particular transportation mode.
5. **Route assignment** allocates trips between an origin and destination by a particular mode to a route or service. The allocation of trips to routes in the highway model takes into account the congestion caused by other travellers.

2.3 The three components of the model are:

1	Demand Model which performs the first four stages above.
2 and 3	Highway Assignment Model and Public Transport Assignment Model which undertake the fifth stage in relation to highway and public transport trips.

2.4 The Kirklees Transport Model is a strategic transport model, the coverage of which is shown in Appendix A. The detailed model area is contained within the pink boundary. It can be seen that this detailed modelled area extends beyond the boundary of Kirklees, serving to ensure that traffic to and from areas outside Kirklees enters and leaves the highway network at the correct points. The model covers a full 24 hour period although the highway and public transport assignment models only cover the morning and evening weekday period periods of 0900-0800 and 1700–1800, in addition to an inter-peak average hour 1000-1600.

2.5 The model divides Kirklees and large parts of the neighbouring districts into a number of small zones. The purpose of the model is to understand how people currently move between these zones either on the highway or public transport network. When new development is proposed in the zones, these characteristics can be updated, taking into account the changing demand for travel, and the impact on the two networks can be forecast. A zone and network plan can be found in Appendix B.

2.6 The highway assignment model contains a detailed representation of the local and strategic highway network with associated highway characteristics, which are represented by relationships between flow and speed as well as junction capacities. These characteristics are used within the model to reflect

how much traffic a road can accommodate and what delays will result from the traffic.

2.7 The public transport assignment model contains a representation of the bus and rail routes that make up the local public transport network.

2.8 For the highway element, the model uses existing travel patterns in the time periods described above between zones. These are referred to as trips. These trips are taken from national census data, known as Journey to work data and, more locally, from mobile phone data. This has been supplemented by 9 roadside interviews in order to provide actual “on the ground” journey purpose information and undertake some validation of the mobile phone data.

2.9 The trips are then assigned to the highway network based on the principle of user equilibrium[1]. To ensure the numbers of vehicles on the network adequately reflects what is happening on the street, the assignment is verified against traffic counts that have taken place around the district. Clearly it is not financially feasible or practical to count traffic on every single road in the district or indeed in the modelled area. However as many major routes as possible are counted, along with known links between these routes and routes around local settlements. A plan and list of all the count locations is shown in Appendix C.

2.10 To ensure that journey times across the network are realistic the journey times on 25 routes were surveyed and these data used to calibrate the model.

2.11 For the public transport element, the model is built using Census journey to work data with other journey purposes being synthesised. Counts were undertaken at around 50 locations to check that the volume and routing of trips across the network are realistic.

2.12 Further information on the structure of the Kirklees Transport Model 2015 update is provided in the following reports:

- Kirklees Transport Model Specification 2015
- Local Model Validation Report, Kirklees Transport Model 2015

[1] *The journey times in all routes actually used are equal and less than those which would be experienced by a single vehicle on any unused route.* Each user non-cooperatively seeks to minimize his cost of transportation. The traffic flows that satisfy this principle are usually referred to as "user equilibrium" (UE) flows, since each user chooses the route that is the best. Specifically, a user-optimized equilibrium is reached when no user may lower his transportation cost through unilateral action. *At equilibrium the average journey time is minimum.* This implies that each user behaves cooperatively in choosing his own route to ensure the most efficient use of the whole system

3. Transport Study Methodology

3.1 In addition to the base modelled 2015 flows, the study considered future year growth scenarios of 2020 and 2030 in line with the plan period. These future year scenarios contained various assumptions relating to potential changes to the highway network and traffic demand.

3.2 Traffic growth was applied to the base model to account for forecast changes in traffic demand in the two forecast years. The growth was calculated based on best practice guidance and future housing and employment targets.

3.3 Traffic growth is the change over time of the number of cars and goods vehicles on the highway network. When forecasting the performance of the highway network in the future, it is necessary to allow for changes in traffic demand.

3.4 Traffic growth can be split into two broad areas:

1. New trips: Changes in population and employment directly affect how many trips are made.
2. Frequency of trips: Changes in GDP, income, car ownership and travel costs affect how frequently people travel by each mode.

3.5 The first of these are taken from the Kirklees Local Plan. Outside of the Kirklees area the forecasts contained within the DfT National Trip End Model are used.

3.6 The changes in the second group of factors are taken from national forecasts provided either within TEMPRO or in the DfT's WebTAG guidance for transport modelling.

4. Tests Undertaken

4.1 As noted earlier the purpose of the model is to understand the cumulative impact of the development allocations in the Kirklees Local Plan. As part of this analysis, current transport schemes that are being worked on by the Council to mitigate the impact of the development have also been tested. The results have been used to inform the effectiveness of the current mitigation strategy and identify any gaps in infrastructure provision.

4.2 Initially a base model was constructed for 2015. The base model gives as realistic a representation as is possible of the current flows on the transport network, using the Census, mobile phone and road side interview data, supplemented with the traffic count and journey time surveys. Once the base model was constructed, 2 forecast years were created, 2020 and 2030, i.e. 5 and 15 years from the base.

4.3 Within each forecast year, two scenarios were run using the model and these are presented below. The 2014 Planning Practice guidance states that: “The Local Plan should make clear, for at least the first five years, what infrastructure is required, who is going to fund and provide it, and how it relates to the anticipated rate and phasing of development. This may help in reviewing the plan and in development management decisions. For the later stages of the plan period, less detail may be provided as the position regarding the provision of infrastructure is likely to be less certain.”

4.4 Housing, mixed use and windfall development site phasing has been estimated across the local plan period, according to the information available to the planning team, with windfall sites being assigned to model zones according to the level of existing development in each zone. Employment site phasing has been spread evenly across the local plan period. Mineral and waste sites were assigned phasing information according to the information available to the planning team. This data was used in the growth model to generate cumulative development levels, which ensured that development impacts were introduced in appropriate model years.

4.5 The following table summarises the forecasts and what transport schemes were tested.

Table 1: Modelled Scenarios

Forecast	Forecast Name	Contains (development supply)	Contains (Transport Supply)
1	Base	Nothing	Nothing- This is the current situation in 2015 and is a representation of the highway network as it operates now.
2	Do Minimum 2020	5 year allocation Commitments Windfall	Nothing- This test shows how the network would cope with no transport interventions in 5 years from now
3	Do Something 2020	5 year allocation Commitments Windfall	1. A616/B6108 Lockwood Bar junction improvements 2. Cavalry Arms Junction + widening on approach to Ainley Top + Red Route 3. Dewsbury Ring Road Schemes- A638 / A652 and B6409 / Church Street 4. Holmfirth Roundabout 5. UTC Package
4	Do Minimum 2030	15 year allocation Commitments Windfall	Nothing- This test shows how the network would cope with no transport interventions in 15 years from now, i.e. the end of the plan period
5	Do Something 2030	15 year allocation Commitments Windfall	As Do Something 2020, plus 1. Bradley Link Road, Bradley+ Cooper Bridge + Three Nuns junctions 2. M62 J24a 3. A62 Leeds Road schemes 4. A653 / B6128Shaw Cross 5. Ravensthorpe Relief Road + potential road improvements around South Dewsbury 6. A62 Longroyd Bridge 7. Selected primary route traffic management treatment. (Link Red Routes)

5. Results of Do Minimum- Base Situation 2015

5.1 The forecast scenarios were created by amending the model to include additional development traffic, applying traffic growth and where relevant, including new traffic schemes, to the validated base model.

5.2 The forecast scenarios also included a traffic signal optimising procedure. The signal timings contained within the model are fixed at the start of the model run, and changes in traffic flow due to developments may result in the original timings becoming inappropriate. The majority of signalised junctions within Kirklees operate on a system which coordinates signal timings, so junction capacity at these locations may be underestimated without optimisation.

5.3 The results of the forecast scenarios were then analysed in the am peak (0800-0900) and a number of outputs created. The model outputs include traffic flows, queues, delays, and the Ratio of Flow to Capacity (RFC) for junction movements in the model. The RFC of a movement at a junction is a measure of the congestion of that movement. A movement with a capacity of 1,000 vehicles per hour and a traffic demand of 900 vehicles per hour has an RFC of 0.9.

5.4 The maximum ideal junction performance is when no movements have an RFC of in excess of 0.85–0.9. A junction is defined as operating over capacity if it has a movement with an RFC greater than one. However the model represents an average day and traffic flow is subject to day to day as well as seasonal variation. This means that a junction which is modelled with a RFC of 0.85 on an average day may exceed 1.0 on some days. As the RFC increases above 0.85 then the delays experienced tend to increase exponentially and this in turn leads to unreliable journey times and an increase in queuing. The number of days when the turn is operating with an RFC of 1.0 will also increase.

5.5 A lot of thought has been given as to how best represent the results from the model. It is considered important for readers to understand how congested particular junctions are now.

5.6 Rejected options have included:

a) Flagging a junction as congested if any one turn in the junction exceeded an RFC of 85% and then categorising the results into 3 bands:
    1. 85%-90% RFC
    2. 90%-95% RFC
    3. >95% RFC

b) Using a demand weighted average RFC across the whole junction. This option fails as there may be junctions with fairly busy movements but are operating under capacity, but it is not possible to reallocate the spare capacity elsewhere within the junction. Ainley Top is an example of this as there is spare capacity on some of the internal movements which cannot be allocated to the external arms. This brings the demand weighted average down to an unrealistic level for reporting purposes.

c) Refining option a) to include only junctions where there is a movement with an RFC greater than 85% and a flow rate greater than 600 PCUs[2] in one peak hour. Junctions are then prioritised based on the total delay, which is represented as flow (PCU) * delay (sec) summed across all movements within the junction.

5.7 In order to include junctions where congestion issues are known, sensitivity tests were carried out on option c) using flow rates between 600 and 300 PCUs. A flow rate of 350 PCUs was eventually settled on along with the RFC being greater than 85%. This is referred to as option d).

5.8 350 PCUs per hour equates to almost 6 vehicle movements per minute, which could be considered conservative, but was chosen as spatial analysis of the results showed that it picked up the majority of junctions where council officers recognised that residents would point out that some degree of congestion already occurs.

[2] Traffic is composed of various types of vehicles, the range and relative composition of which can vary from location to location. Traffic modelling software frequently utilises a common unit, known as the Passenger Car Unit (PCU), to represent general traffic. Common vehicle types are assigned a conversion factor so that an equivalent PCU value can be generated from classified vehicle data collected. Nominally 1 PCU is 5.75m

6. Results of Do Minimum- 2020 and 2030

6.1 The National Planning Policy Framework places great importance on Local Plans being evidence based. Paragraph 162 states that Local Planning Authorities should assess the quality and capacity of infrastructure for transport and its ability to meet forecast demands.

6.2 For this reason the impact of potential new development across the plan period on the transport network has been assessed. This is calculated as the junctions in the model that experience the greatest levels of congestion as a result of development. The Plan's mitigation strategy is based around accommodating the impact of new development.

6.3 The table below summarises this and shows how these have been calculated from the traffic model forecast scenarios:

Table 2: Summary of the Do Minimum Scenarios

Grouping	Explanation	Model
1	Junctions ranked in order of congestion based on option d) congestion indicator	Base Congested Situation (Forecast 1)
2	Junctions ranked in order of congestion after 5 years of development based on option d) congestion indicator	Forecast 2 (Do minimum 2020)
3	Junctions ranked in order of congestion after 15 years of development based on option d) congestion indicator	Forecast 4 (Do minimum 2030)

6.4 The top 30 for each group have been mapped and these are shown in Figure 1 and Figure 2 below:

Figure 1: Congested Junctions – Northern Kirklees

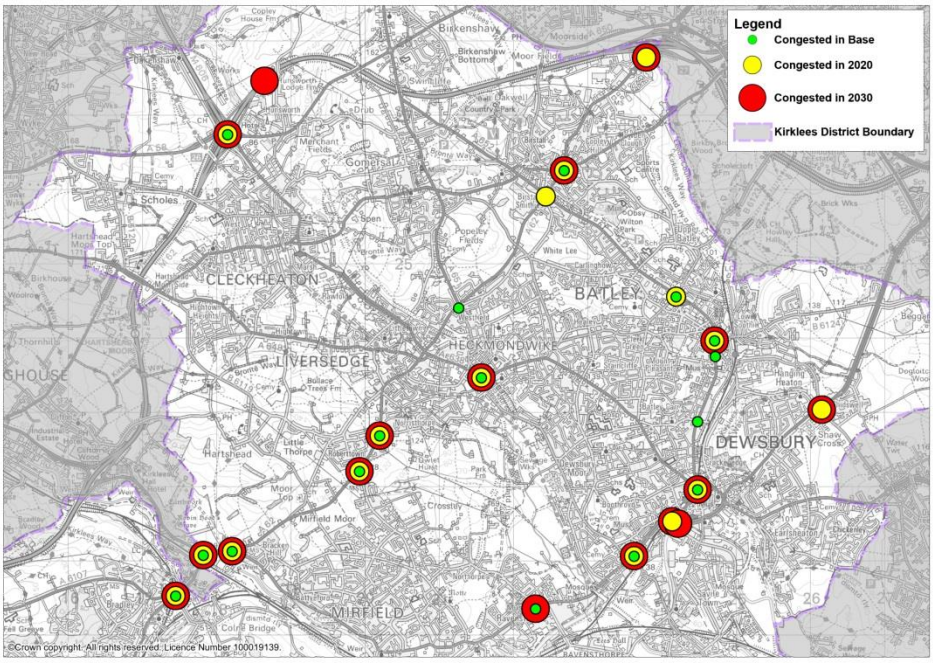
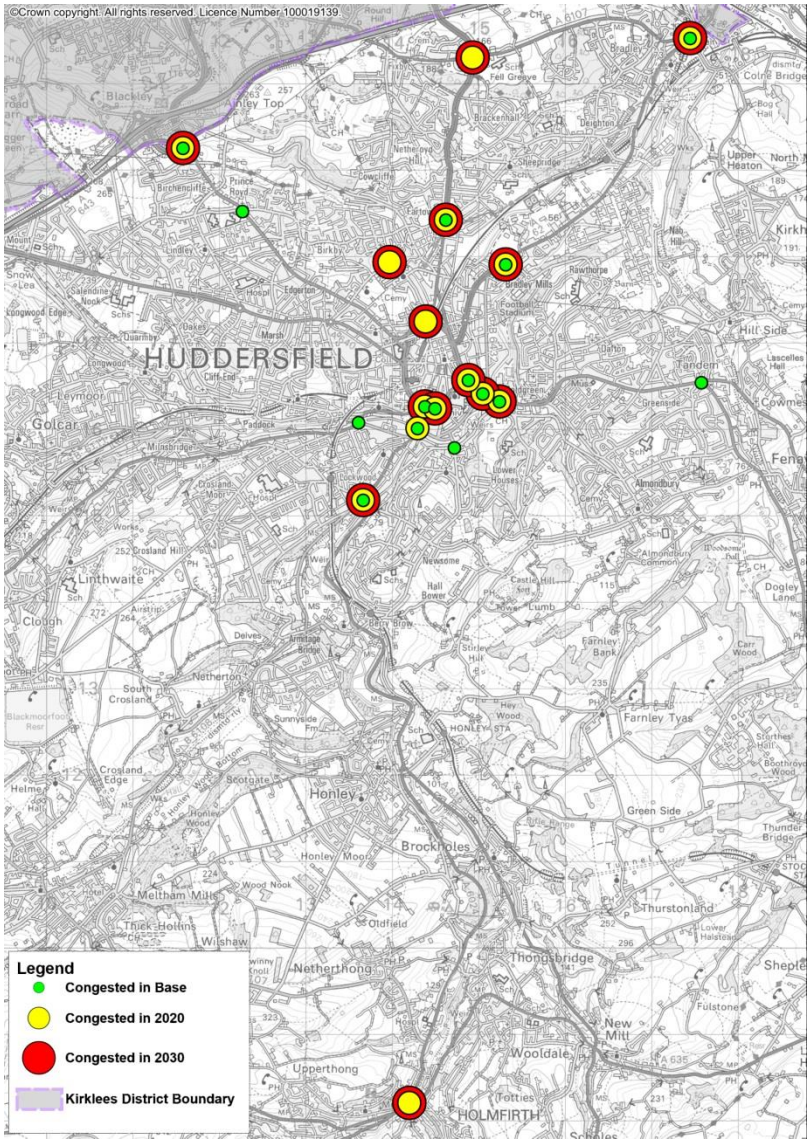


Figure 2: Congested Junctions - Southern Kirklees



6.5 Whilst the choice of dealing with 30 is an arbitrary decision, it is reasonable to consider these as a priority and that a realistic mitigation strategy can be developed as a result.

6.6 Full lists of all the junctions ranked in the 3 do-minimum scenarios can be found in Appendix D. Care should be taken when interpreting these rankings. The total delay figure (in hours) in the final column in the tables is a planning figure and has been calculated to assist the Planning Authority in understanding total delay over the full AM and PM hours for all vehicles using the whole junction in question and therefore where improvements are most needed from a strategic plan perspective. For example there are occasions where high ranking junctions (in any forecast scenario) show low delays per vehicle, but because they are being used by large numbers of vehicles, the total delay is extremely high.

6.7 Impacts on individual drivers, i.e. Individual vehicle delays are to be found in the column adjacent and give a better feel for average delay incurred.

7. Do Something Position

7.1 To arrive at a do something position (i.e. an understanding of what the transport mitigation strategy should look like), a spatial analysis of the results of the three do-minimum scenarios was undertaken. This analysis of the top 30 junctions in the 3 do minimum scenarios shows that they fall into 9 broad areas or corridors and a mitigation strategy has been designed to reflect these impacts. The references reflect the schemes as they have been identified in the draft Kirklees Local Plan- Allocations and Designations Document and the Kirklees Infrastructure Delivery Plan. Appendix E shows the mitigation strategy and its broad congruence with the congested junctions.

7.2 The following table provides detail on the mitigation strategy and shows how, through identified programmes and funding sources, Kirklees intends to address these highway issues.

7.3 All the locations flagged through the modelling work as being congested or impacted by development traffic in future years have been identified through a strategic forecasting process and they should be read as what might happen given a number of assumptions, not what will happen. Therefore the Authority will continue to work to refine both the forecasts and the mitigation strategy between now and submission of the plan to the Secretary of State in late 2016.

Table 3: Congestion Locations and Programme Opportunities

Corridor /Area	Location	Programme and funding Opportunity[3]
TS 1	A62 Leeds Road /Bradley Mills Road A62/A6107 (Bradley Road) A62/A644 (Cooper Bridge) A62/A644 (Three Nuns) A62/Sunny Bank Road A62/Norristhorpe Lane A638/High Street/B6117 Market Street A62/A652 (Six Lane Ends) A62/A652 (Birstall Smithies) A62/A643 (Coach and Six)	West Yorkshire Transport Fund Projects: • A62/A644 Cooper Bridge Junction • A62 and A644 corridors including work around South Dewsbury and Ravensthorpe. Leeds Road Cycle Super Highway

Cont.

[3] All WY+TF project information can be found at http://www.westyorks-ca.gov.uk/wytf/ and https://democracy.kirklees.gov.uk/Data/Cabinet/201304251600/Agenda/CABINET25041348113D.pdf

Corridor /Area	Location	Programme and funding Opportunity
TS 2	A641 Bradford Road/ A6107 Bradley Road Full diamond junction at the overbridge of the A641 (Bradford Road) and the M62 A641 Bradford Road/ Spaines Road (Fartown Bar) A62 Castlegate/ St Johns Road/ A641 Bradford Road	West Yorkshire Transport Fund Project : • M62 Junction 24a scheme including works to the A641 Bradford Road
TS 3	A62/B6432 (Longroyd Bridge) A616/B6108 (Lockwood Bar) A62/B6432 (Folly Hall) Newsome Road/Kings Mill Lane A62 Queensgate / A616 Chapel Hill / A62 Manchester Road A62 Queensgate/Alfred Street A62/A629 (Shorehead) A629/B6432 St Andrews Road A629/Somerset Road A629/A642 (Waterloo) A635/A6024 (Holmfirth)	Lockwood Bar and Chapel Hill- Part funded Through the West Yorkshire Transport Fund (Highways Efficiency and Bus Priority Programme) Intention to expand this programme to cover the remaining two junctions.
TS 4	A629/HalifaxRoad/BlackerRoad (to reduce congestion at Blacker Road/St .John's Road due to rerouting to avoid the A629) A629/ East Street (Cavalry Arms) Ainley Top	West Yorkshire Transport Fund: • A629 Corridor

Cont.

Corridor /Area	Location	Programme and funding Opportunity
TS 5	A644/Huddersfield Road/Calder Road/North Road (Ravensthorpe Gyratory) A644 Huddersfield Road/B6117 Thornhill Road A644 Webster Hill / A638 Dewsbury Ring Road A638 Dewsbury Ring Road/A638 Halifax Road A638/Mill Street West A652 Bradford Road/Town Street A652/B6123 (Rouse Mill Lane) A652/B6124 (Soothill Lane) A652/B6128 (Stocks Lane) A653 Leeds Road – B6128 Challenge Way	West Yorkshire Transport Fund Project: • A653 Dewsbury to Leeds Corridor
TS8	This scheme tackles congestion hot spots across West Yorkshire with improvements to traffic control; systems and integration of traffic management and traffic signal control centres.	No funding opportunity identified to date , although partial funding will be sought from the WY+TF Highway Network Efficiency Programme (HNEP)
TS9	Highway Efficiency and Bus Priority Programme including: A62- Huddersfield to Leeds (not including A62/A6107 Bradley Junction, the A62/A644 Cooper Bridge and Three Nuns junctions as these are in a separate scheme) Huddersfield Southern Gateways including key junctions identified through the transport modelling on the A616 and A62 and in Holmfirth town centre A629- Broad Lane to Waterloo	West Yorkshire Transport Fund Project: • Highway Efficiency and Bus Priority Programme HEBP
TS10	A programme of core cycling and walking schemes in around Kirklees	No funding opportunity identified to date, but linkages to TS1 will be made and complimentary schemes developed.
TS11	M62/M606/A58/A638 (Chain Bar) M62 Junctions 20-25 Smart Motorway M62 Junction 24 (Northern dumb- bell and link to Ainley Top) M62 Junction 27 (Southern dumb-bell)	Highways England Roads Investment Strategy (See section 4.3.1 above)

8. Impact of Mitigation

8.1 To understand the impact of the mitigation strategy a number of key transport corridors have been chosen, broadly congruent with the forecast existing and potential areas of congestion identified in forecasts 1, 2 and 4 in table 1 above.

8.2 The key transport corridors and extents are shown in figure 3 below.

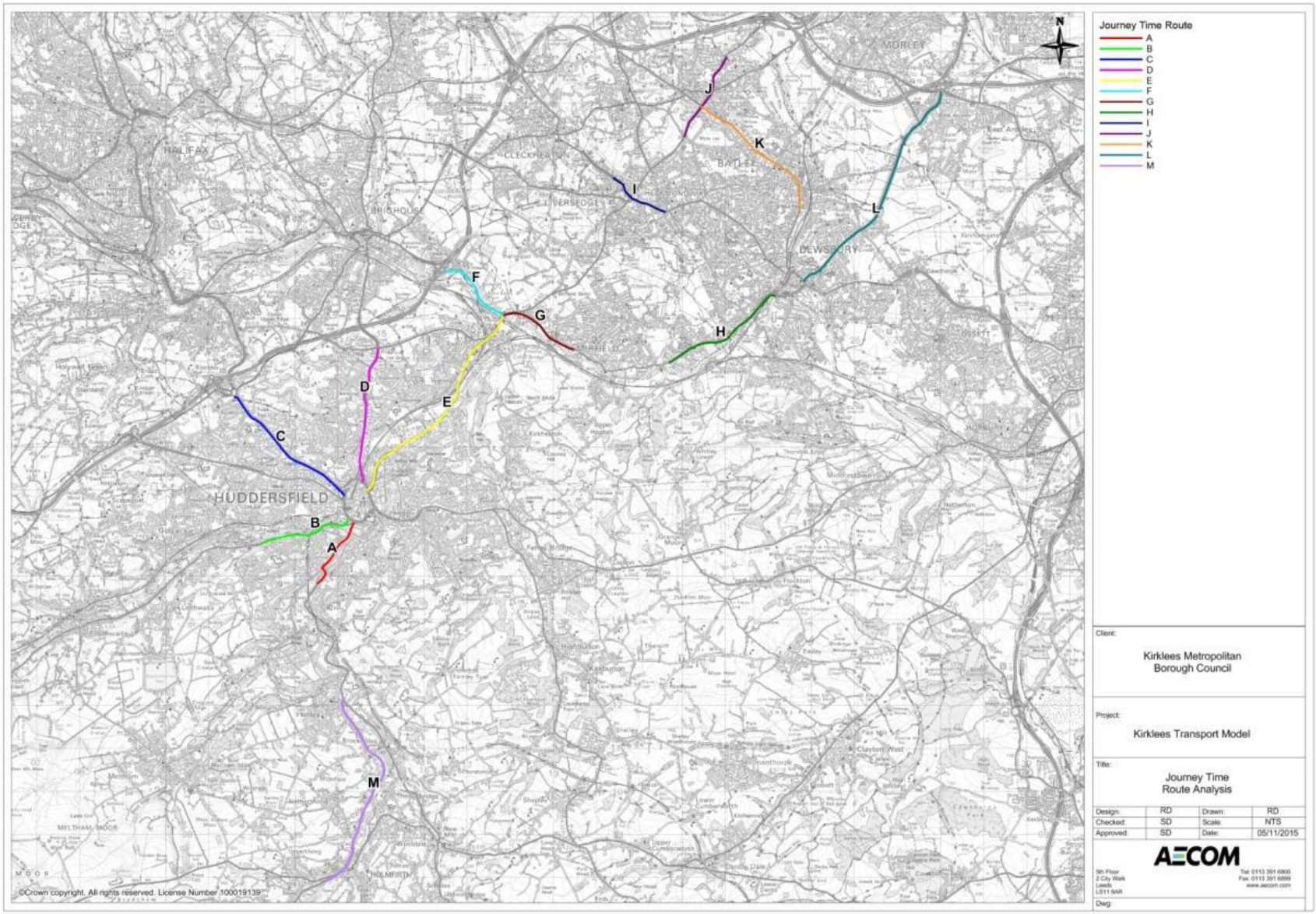
8.3 The transport models have been run to include the known mitigation schemes set out in Table 1 above (Forecasts 3 and 5). The impact of these schemes in terms of journey time along the congested corridors is set out in Table 4 below.

8.4 This shows that there is an improvement in the average speed along the congested corridor as a result of implementing the schemes in the existing programmes.

Table 4: Change in Journey Time as a result of Implementing Schemes in Existing Programmes

Congestion / Mitigation Area	Route Key (Map)	Route	BASE AM	DM 2020 AM	DM 2030 AM	DS 2020 AM	DS 2030 AM
			Time (min:sec)	Time (min:sec)	Time (min:sec)	Time (min:sec)	Time (min:sec)
TS1	E	A62 Hudds RR - Cooper Bridge	15:20	17:10	18:10	17:10	13:30
TS1	F	A644 M62 J25 - Cooper Bridge	06:00	08:50	11:30	08:50	02:00
TS1	G	A644 Stocks Bank Rd - Cooper Bridge	09:00	12:10	14:00	12:10	03:30
TS2	D	A641/A6107 Roundabout - Hudds RR	06:20	06:30	06:10	06:30	10:00
TS3	A	A616 Taylor Hill - Chapel Hill	05:50	07:00	07:50	06:50	07:00
TS4	C	A629 Hudds RR - Ainley Top	10:10	12:30	13:50	11:10	12:00
TS5	H	A644 Low Mill Ln - Webster Hill	08:30	10:10	10:40	10:00	09:20
TS5	L	A653 Dewsbury - M62 J28	10:20	10:50	13:10	10:50	11:40
TS6/TS8	J	A62 White Lee Road - Dark Lane	05:10	05:40	06:00	05:40	06:40
TS6/TS8	K	A652 Alexandra Rd – Birstall Smithies	07:30	08:00	09:10	07:30	08:40
TS7	I	A638 Knowler Hill – Station Ln	07:50	11:10	11:30	11:10	11:10
TS9	M	A6024 Modd Lane – A6024 Eastgate	09:20	11:30	12:00	10:30	10:20

Figure 3: Journey Time Routes



9. Concluding Remarks

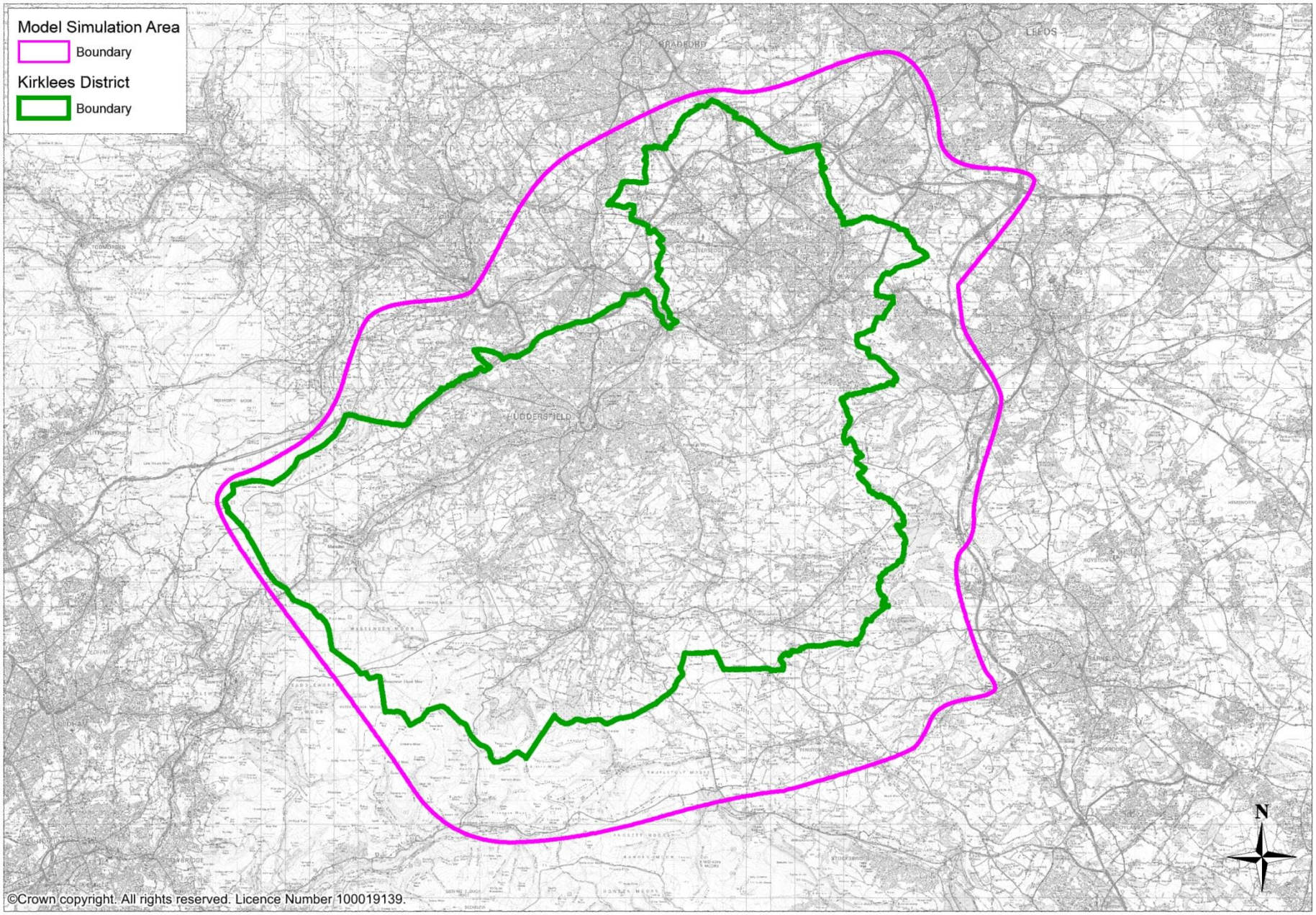
9.1 The results of the journey speed analyses show that do something (i.e. with all the development and the proposed transport schemes in place) forecast year results have generally improved or remained fairly constant when compared to the do minimum results. This evidence backs up the conclusion that at a district-wide level the proposed transport mitigation strategy can accommodate the development proposed in the Kirklees Local Plan period 2016-2031.

9.2 The model is a strategic representation of a large proportion of the Kirklees transport network and care must be taken when interpreting the results at the relatively spatially coarse short corridor level. Nonetheless the results at a corridor level do give an indication of where further investigation and analysis must be carried out to understand the impact of the proposed land uses allocations and the subsequent impact of the mitigation proposed

9.3 Throughout the more detailed analysis and investigation of the traffic model the Local Authority will ensure that appropriate mitigation is developed.

Appendix A

Model Area Coverage


Model Simulation Area
Boundary
Kirklees District
Boundary
BRADFORD
LEEDS
HUDDERSFIELD
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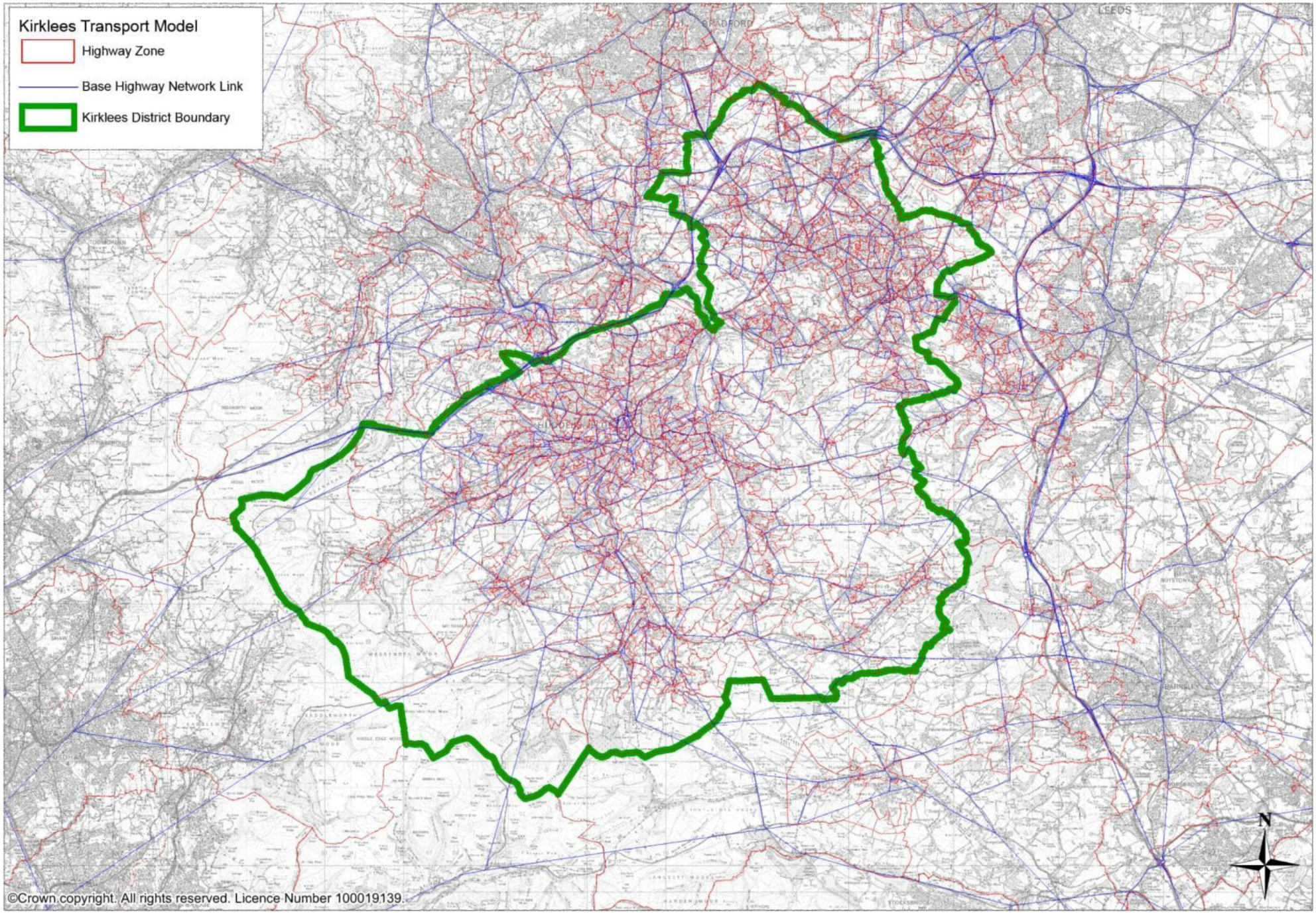
Appendix B

Zone and Network Plan


Kirklees Transport Model
Highway Zone
Base Highway Network Link
Kirklees District Boundary
LEEDS
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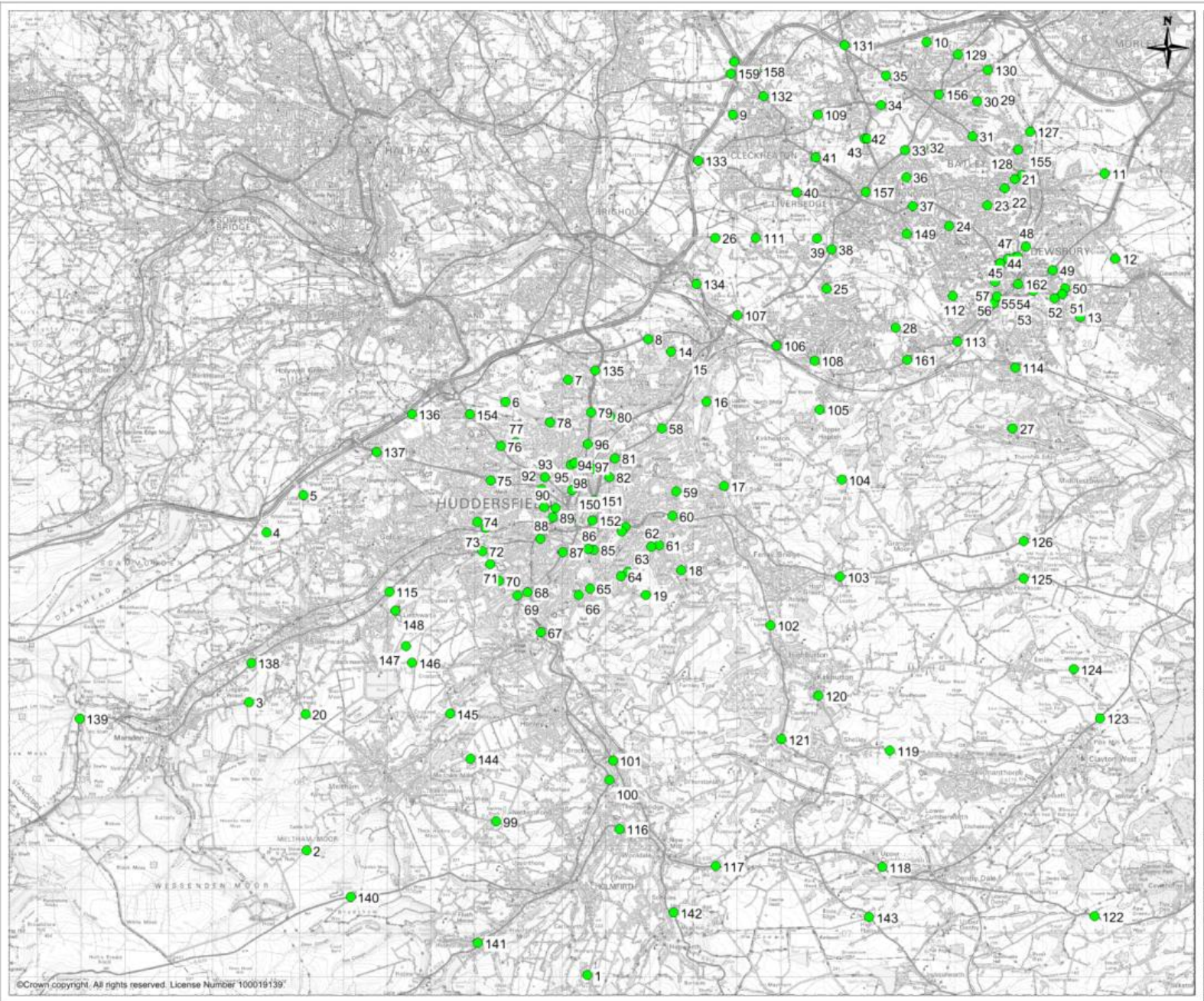
Appendix C

Location of Traffic Counts



Key

- Proposed ATC and MCC Location

Client: Kirklees Council

Project: Kirklees Transport Model

Title: Proposed ATC and MCC Locations

Design:	RD	Drawn:	RD
Checked:	JP	Scale:	NTS
Approved:	SD	Date:	03/03/2015

AECOM
5th Floor
2 City Walk
Leeds
LS11 9AR
Tel: 0113 391 6800
Fax: 0113 391 6899
www.aecom.com

Dwg: 002

#	ATC/MCC Location
1	B6106 Dunford Road - between Longley Edge Lane and Longley Edge Road
2	Wessenden Head Road - between Pennine Way and Leygards Lane
3	B6107 Chain Road - between Lingards Road and B6107 Meltham Road
4	Quebec Road - between A640 New Hey Road and Rochdale Road
5	Round lngs Road - between A640 New Hey Road and Hall Lane
6	Grimescar Road - between Burn Road and Halifax Old Road
7	Lightridge Road - between Broomfield Road and The Fairway
8	A6107 Bradley Road - between Redwood Drive and Lamb Cote Road
9	B6120 Turnsteads Avenue - between Whitechapel Rd and Turnsteads Crescent
10	B6125 Field Head Lane - between Owler Lane and Fieldhead Crescent
11	B6124 Soothill Lane - between Manor Farm Drive and A653 Leeds Road
12	B6128 Owl Lane - between Windsor Road and Pickering Lane
13	Ossett Lane - between Town Street and Jilling Ing Park
14	Alandale Road - between Gisbourne Road and Staynton Crescent
15	Keldregate - between Brooklands and Copthorne Gardens
16	Dalton Bank Road - between B6118 Colne Bridge Road and Jagger Lane
17	School Lane - between Crossley Lane and Newland Road
18	Northgate - between Southfield Road and Thorpe Lane
19	Kaye Lane - between Longley Lane and Wheatroyd Lane
20	B6107 Slaithwaite Road - between B6109 Varley Road and Deer Hill End Road
21	Commercial Street - between Market Place and Wards Hill
22	Wellington Street - between East Street and Cambridge Street
23	Dark Lane - between Woodsome Estate and Manor Way
24	Dewsbury Gate Road - between Occupation Lane and Moor End Lane
25	Sunny Bank Road - between Sunny Bank Drive and Crossley Lane
26	Blake Law Lane - between M62 and Church Lane/ Hartshead Lane
27	Edge Top Road - between Overthorpe Avenue and Cross Avenue
28	Shillbank Lane - between Eastfield Road and North Road
29	Upper Batley Low Lane - between Brow Wood Road and Upper Batley Lane
30	Upper Batley Lane - between Woodlands Road and Wind mill Lane
31	A652 Bradford Road - between Anne Street and Denham Street
32	B6122 White Lee Road - between Carlinghow Lane and Rinding Street
33	A62 Leeds Road - between Stubley Farm Road and B6122 Muffit Lane
34	A643 Church Lane - between Craven Drive and B6122 Muffit Lane
35	A652 Dewsbury Road - between Nutter Lane and Mock lngs Avenue
36	Dale Lane - between Lincoln Avenue and Brighton Street
37	A638 High Street - between North Street and Cawley Lane
38	A62 Huddersfield Road - between Balmfield Crescent and Norristhorpe Lane
39	Robertown Lane - between Child Lane and Richmond Park Avenue
40	A649 Halifax Road - between Springfield Lane and Primrose Lane
41	A638 Bradford Road - between Rawfolds Way and Primrose Lane
42	Quarry Road - between Lower Lane and California Lane
43	A651 Oxford Road - between Lower Lane and California Lane

#	ATC/MCC Location
44	A638 Halifax Road - between Stonefield Street and Northfield Road
45	Pyrah Street - between Carlton Road and Hartley Street
46	Meadow Lane - between Carlton Road and Hartley Street
47	A652 Bradford Road - between Mill Road and Carlton Road
48	Crackenedge Lane - between Caulms Wood Road and Peter Hill
49	A653 Leeds Road - between Sugar Lane and Bywell Road
50	Old Bank Road - between Sugar Lane and York Road
51	A638 Wakefield Road - between High Road and Cross Park Street
52	High Road - between A638 Wakefield Road and Middle Road
53	B6409 Savile Road - between Link Road and Mill Street
54	Mill Street W - between A644 Webster Hill and Cannon Way
55	A644 Webster Hill - between Cemetery Road and Pinfold Hill
56	High Street - between Middle Road and Boothroyd Lane
57	Moorlands Road - between Moorlands Avenue and Boothroyd Lane
58	A62 Leeds Road - between Old Fieldhouse Lane and Syngenta access
59	Long Lane - between Ridgeway and Tolson Crescent
60	A629 Wakefield Road - between Mayfield Avenue and Ravensknowle Road
61	Almondbury Bank - between Forest Road and Bank End Lane
62	Somerset Road - between Longley Road and Foxglove Road
63	Hall Cross Road - between Hall Cross Grove and Lowerhouses Lane
64	Wood Lane - between Ashenhurst Avenue and Lowerhouse Lane
65	Newsome Road - between Hart Street and Dawson Road
66	Church Lane - between Towngate and Newsome Road
67	A616 Woodhead Road - south of Taylor Hill Road
68	B6108 Meltham Road - south of Hanson Lane
69	Beaumont Park Road - between Dryclough Road and Moor End Road
70	Walpole Road - between Dryclough Road and Gilbert Grove
71	Blackmoorfoot Road - between Gramfield Road and Frederick Street
72	A62 Manchester Road - between Factory Lane and Park Road W
73	Lower Gate - between Cross Firs Street and Clough Lane
74	Quarmby Road - between Longwood Road and Douglas Avenue
75	A640 New Hey Road - between Reinwood Road and Wellfield Road
76	A629 Halifax Road - between Daisy Lea Lane and Talbot Avenue
77	Birkby Road - between Stanwell Avenue and Bryan Road
78	Halifax Old Road - between S Cross Road and Grimscar Avenue
79	A641 Bradford Road - between Dewhurst Road and Fartown Green Road
80	Woodhouse Hill - between Central Avenue and Dewhurst Road
81	A62 Leeds Road - between Thistle Street and Grove Road
82	B6432 St. Andrew's Road - between Thistle Street and Gasworks Street
83	A629 Wakefield Road - between Silver Street and Smithy Lane
84	Somerset Road - between Maple Street and Dog Kennel Bank
85	Newsome Road - between King's Mill Lane and Elm Street
86	Damside Road - between Queens Mill Road and King's Bridge Road

#	ATC/MCC Location
87	A616 Chapel Hill - between Caine Road and St. Thomas' Road
88	A62 Manchester Road - between Longroyd Lane and Outcote Bank
89	Springwood Avenue - between Oastler Avenue and Park Avenue
90	Greenhead Road - between Park Grove and Park Avenue
91	Park Drive S - between Gledholt Road and Park Avenue
92	A640 Trinity Street - between Park Drive and Fitzwilliam Street
93	A629 New N Road - between Mountjoy Road and Vernon Avenue
94	St. John's Road - between St John's Crescent and Beck Road
95	Beck Road - between St. Johns Road and Willow Lane
96	A641 Bradford Road - south of Willow Lane E
97	Alder Street - between Hillhouse Lane and Hebble Street
98	Great Northern Street - between Hillhouse Lane and Lower Viaduct Street
99	B6107 Wilshaw Road - between Bradshaw Road and Knoll Lane
100	A6024 Woodhead Road - between Hagg Wood Road and Calf Hill Road
101	A616 New Mill Road - between Brockholes Lane and Island Drive
102	A629 Penistone Road - Woodsome Road and Far Dene
103	A642 Wakefield Road - Pinfold Lane and Paul Lane
104	B6118 Liley Lane - between Tanhouse Lane and Healey Green Lane
105	Hopton Lane - between Hopton Hall Lane and Waste Lane
106	Wood Lane - between A444 Huddersfield Road and Helm Lane
107	A644 Leeds Road - between Cooper Bridge Road and A62 Leeds Road
108	A644 Huddersfield Road - between Stocks Bank Road and Doctor Lane
109	A643 Spen Lane - between Fusden Lane and Gomersal Lane
111	B6119 Peep Green Road -between Windy Bank Lane and School Lane
112	B6117 Heckmondwike Road - between Stainclifle Road and Beckett Lane
113	A644 Huddersfield Road - between Park Road and Railway Street
114	B6117 Slaithwaite Road - between Brewery Lane and Churchbank Way
115	A62 Manchester Road - between Church Avenue and Hoyle Ing
116	A635 New Mill Road - between Heys Road and Springwood Road
117	A635 Penistone Road - between Hollins House Lane and Horn Lane
118	A635 Barnsley Road - between Cumberworth Lane and A636 Wakefield Road
119	B6116 Huddersfield Road - between Bark House Lane and Shelley Woodhouse
120	B6116 Huddersfield Road - between Lane Head Lane and Queens Way S
121	A629 Penistone Road - between Thunder Bridge Lane and Dam Hill
122	A635 Lane Head Road - between Coach Gate Lane and North Lane
123	A636 Wakefield Road - between Kiln Lane and Litherop Lane
124	Ash Lane - between Hag Hill Lane and A636
125	A637 Barnsley Road - between Pinfold Lane and Hardcastle Lane
126	A642 Wakefield Road - between Grange Lane and Nat Coal Mining Museum
129	A62 Gelderd Road - between Oakwell Way and Dark Lane
130	A643 Leeds Road - between Nab Lane and Windsor Road
131	A651 Bradford Road - between Manor Park Gardens and A652 Dewsbury Road
132	A638 Bradford Road - between Exchange Street and B6121 Hunsworth Lane
133	A649 Halifax Road - between Moorside and M62 bridge

#	ATC/MCC Location
134	A644 Wakefield Road - between Premier Inn access road and M62
135	A641 Bradford Road - between Hazel Grove and Woodside Lane
136	A643 Lindley Moor Road - between Crosland Road and Haigh House Hill
137	A640 New Hay Road - between Moorlands Road and Oxleys Square
138	A62 Manchester Road - between West Slaithwaite Road and Yew Tree Lane
140	A635 Greenfield Road - between Wessenden Head Road and Harden Moss Road
141	A6024 Woodhead Road - between Digley Road and Bank Lane
142	A616 Sheffield Road - between Bank Street and East Street
143	A629 Penistone Road - between Mill Bank and Quaker Bottom
127	B6123 Timothy Lane - between Batley Field Hill and Howley Mill Lane
128	B6123 Batley Field Hill - between Willow Court and York Road
139	A62 Manchester Road - between Hey Green and Mount Road
144	Knowle Lane - between Wood Nook Lane and Acre Lane
145	B6108 Huddersfield Road - between Crosland Factory Lane and Bent Ley Road
146	Black Lane - between Arboray Lane and Reservoir Side Road
147	Blackmoorfoot Road - between Nopper Road and Heath Road
148	Cowlersley Lane - between Church Lane and Tommy Lane
149	B6117 Walkley Lane - between Walkley Avenue and Artillery Street
150	Castlegate A62 - between A629 clockwise on-slip and St Johns Rd anti-clockwise on-slip
151	A62 Southgate – south of St Peter's Street
152	A62 Queensgate – between Queen St and Zetland St
153	A62 Castlegate - south of Market St/Merton St
154	A629 Halifax Rd – between Birchington Ave and Rock Rd
155	A652 Bradford Rd – between Park Rd and Bridge St
156	A62 Huddersfield Rd – between A643 Leeds Rd and Brookroyd Rd
157	A62 Leeds Rd – between A638 and Thornleigh Dr
158	A58 between Chain Bar roundabout and Centurion Way
159	A58 – west of Chain Bar roundabout
160	Bradford Road – north-west of Chain Bar roundabout
161	A644 Huddersfield Road – between Fir Parade and Armitage Street
162	A638 Dewsbury Ring Road – between Bond St and Croft St
163	A638 Rishworth Road – between Wakefield Rd and Railway St

Appendix D

Base and Do Minimum Scenarios

Junction Ranking

Base Scenario- Junction ranking

TS Scheme	No.	Junction	BASE Delay/veh (secs)	BASE Flow	BASE DELAY (Hrs)
There are no TS scheme associated with this ranking because if the junction is already congested then that is not attributable to the cumulative effect of the local plan designations	1	M62 J26 - M606 Chain Bar	17	67962	329.74
	2	Ainley Top	27	26014	197.35
	3	Cooper Bridge	48	7845	105.18
	4	A62 Leeds Road - A644 Huddersfield Road Three Nuns signals	173	1929	92.50
	5	A62 Leeds Road - A6107 Bradley Road signals	65	3177	56.96
	6	A638 High Street - B6117 Market Street signals	100	2035	56.38
	7	A641 Bradford Road - Spaines Road signals	60	2820	46.81
	8	A62 Queensgate - A616 Chapel Hill - A62 Manchester Road signals	56	2856	44.71
	9	A62 Shorehead Roundabout	22	6862	42.19
	10	A644 Huddersfield Road - Thornhill Road signals	52	2768	39.96
	11	A616 Lockwood Road - B6108 Meltham Road signals	57	2490	39.64
	12	A638 Dewsbury Ring Road - A638 Halifax Road signals	59	2344	38.32
	13	A62 Castlegate - St Johns Road - A641 Bradford Road signals	48	2468	33.22
	14	A644 Webster Hill - A638 Dewsbury Ring Road signals	41	2516	28.49
	15	A641 Bradford Road - Willow Lane East signals	40	2586	28.41
	16	A652 Bradford Road - A62 Huddersfield Road Birstall Smithies signals	53	1918	28.35
	17	A653 Leeds Road - B6128 Challenge Way signals	59	1628	26.83
	18	A616 Chapel Hill - B6432 Colne Road signals	41	2283	26.04
	19	A629 Wakefield Road - B6432 St Andrew's Road signals	25	3669	25.81
	20	A629 Wakefield Road - Somerset Road signals	28	3263	25.26
	21	A642 Wakefield Road - Waterloo Road signals	21	4304	25.13
	22	A62 Manchester Road - Morley Lane - Cowlersley Lane signals	77	1175	25.01
	23	A643 Leeds Road - A62 Gelderd Road - A62 Huddersfield Road signals	41	2061	23.24
	24	A62 Leeds Road - Sunny Bank Road signals	58	1422	23.05
	25	A62 Leeds Road - Thistle Street signals	43	1891	22.82
	26	A62 Huddersfield Road - Norristhorpe Lane signals	46	1779	22.77
	27	A652 Bradford Road - B6128 Rouse Mill Lane signals	51	1575	22.13
	28	Wheathouse Rd - Blacker Rd signals	50	1558	21.43
	29	Ravensthorpe Gyratory	11	6747	21.14
	30	A629 Halifax Road - Birkby Road signals	50	1532	21.07
	31	A62 Leeds Road - A651 Gomersal Road Six Lanes End signals	40	1871	21.01
	32	A652 Bradford Road - Town Street signals	45	1597	20.06

TS Scheme	No.	Junction	BASE Delay/veh (secs)	BASE Flow	BASE DELAY (Hrs)
There are no TS scheme associated with this ranking because if the junction is already congested then that is not attributable to the cumulative effect of the local plan designations	33	A638 Dewsbury Ring Road - A638 Wakefield Road signals	24	2958	19.82
	34	A62 Leeds Road - Bradley Mills Road signals	37	1923	19.77
	35	A652 Bradford Road - B6123 Stocks Lane signals	31	2267	19.61
	36	A62 Castlegate - A640 Trinity Street signals	31	2209	19.28
	37	A638 Dewsbury Ring Road - A653 Leeds Road signals	32	2149	19.12
	38	A652 Bradford Road - B6128 Station Road signals	28	2415	18.64
	39	A62 Southgate - A641 Northgate signals	36	1888	18.62
	40	A62 Leeds Road - Stocks Bank Road signals	47	1410	18.51
	41	A62 Manchester Road - Longroyd Lane signals	58	1153	18.48
	42	Dewsbury Ring Road - southern (DS)	10	6086	17.74
	43	A651 Oxford Road - A643 Spen Lane signals	38	1642	17.44
	44	A6024 Huddersfield Road - A635 Victoria Street signals	76	829	17.42
	45	A638 Aldams Road - B6409 Wilton Street signals	47	1327	17.34
	46	A616 Folly Hall - B6432 Saint Thomas Road signals	27	2246	16.96
	47	A638 Webster Hill - Mill Street West signals	29	2099	16.66
	48	A6107 Bradley Road - A641 Bradford Road roundabout	23	2587	16.46
	49	A62 Leeds Road end of bus lane pedestrian crossing	50	1126	15.60
	50	A62 Southgate - A62 Leeds Road signals	34	1644	15.47

DM 2020 Scenario Junction Ranking.

TS Scheme	Base Rank	New Rank	Junction	DM 2020 Delay/veh (secs)	DM 2020 Flow	DM 2020 DELAY (Hrs)
TS11	1	1	M62 J26 - M606 Chain Bar	22	80914	491.13
TS4/11	2	2	Ainley Top	49	27588	375.44
TS1	3	3	Cooper Bridge	94	7975	208.63
TS1	4	4	A62 Leeds Road - A644 Huddersfield Road Three Nuns signals	268	2119	157.74
TS1	5	5	A62 Leeds Road - A6107 Bradley Road signals	135	3457	130.03
TS3	9	6	A62 Shorehead Roundabout	45	7803	97.66
TS3	8	7	A62 Queensgate - A616 Chapel Hill - A62 Manchester Road signals	99	3409	93.37
TS1	34	8	A62 Leeds Road - Bradley Mills Road signals	134	2444	91.16
TS1	6	9	A638 High Street - B6117 Market Street signals	140	2089	81.42
TS2	7	10	A641 Bradford Road - Spaines Road signals	89	3182	78.80
TS3	11	11	A616 Lockwood Road - B6108 Meltham Road signals	98	2772	75.77
TS1	24	12	A62 Leeds Road - Sunny Bank Road signals	142	1839	72.80
TS2	13	13	A62 Castlegate - St Johns Road - A641 Bradford Road signals	85	2993	70.50
TS3	19	14	A629 Wakefield Road - B6432 St Andrew's Road signals	58	4218	68.30
TS5	10	15	A644 Huddersfield Road - Thornhill Road signals	75	3070	63.83
TS5	53	16	B6409 Savile Road - Mill Street West signals	95	2385	62.64
TS11	177	17	M62 EB east of Chain Bar	31	7105	61.62
TS2	48	18	A6107 Bradley Road - A641 Bradford Road roundabout	72	2904	58.40
TS4	28	19	Wheathouse Rd - Blacker Rd signals	112	1778	55.53
TS5	12	20	A638 Dewsbury Ring Road - A638 Halifax Road signals	69	2892	55.44
TS1	55	21	A62 Huddersfield Road - A649 Halifax Road signals	106	1826	53.87
TS3	18	22	A616 Chapel Hill - B6432 Colne Road signals	71	2584	50.86
TS5	14	23	A644 Webster Hill - A638 Dewsbury Ring Road signals	62	2878	49.57
TS4	30	24	A629 Halifax Road - Birkby Road signals	96	1769	47.36
TS1	23	25	A643 Leeds Road - A62 Gelderd Road - A62 Huddersfield Road signals	65	2596	46.98
TS2	15	26	A641 Bradford Road - Willow Lane East signals	55	2997	45.81
TS1	16	27	A652 Bradford Road - A62 Huddersfield Road Birstall Smithies signals	70	2346	45.49
TS3	44	28	A6024 Huddersfield Road - A635 Victoria Street signals	135	1206	45.23
TS5	17	29	A653 Leeds Road - B6128 Challenge Way signals	74	2207	45.13
TS5	38	30	A652 Bradford Road - B6128 Station Road signals	52	2960	43.05
TS5	35	31	A652 Bradford Road - B6123 Stocks Lane signals	54	2843	42.60
TS1	40	32	A62 Leeds Road - Stocks Bank Road signals	101	1512	42.50
TS1	25	33	A62 Leeds Road - Thistle Street signals	67	2283	42.40
TS3	21	34	A642 Wakefield Road - Waterloo Road signals	27	5445	41.24
	22	35	A62 Manchester Road - Morley Lane - Cowlersley Lane signals	107	1265	37.48
TS3	41	36	A62 Manchester Road - Longroyd Lane signals	88	1521	37.32
TS5	45	37	A638 Aldams Road - B6409 Wilton Street signals	86	1539	36.59

TS Scheme	Base Rank	New Rank	Junction	DM 2020 Delay/veh (secs)	DM 2020 Flow	DM 2020 DELAY (Hrs)
TS5	37	38	A638 Dewsbury Ring Road - A653 Leeds Road signals	47	2751	36.26
TS5	66	39	A638 Market St - Northgate signals	76	1703	36.14
TS5	29	40	Ravensthorpe Gyratory	16	7971	36.07
TS5	27	41	A652 Bradford Road - B6128 Rouse Mill Lane signals	66	1884	34.46
TS5	33	42	A638 Dewsbury Ring Road - A638 Wakefield Road signals	34	3614	34.10
TS1	31	43	A62 Leeds Road - A651 Gomersal Road Six Lanes End signals	56	2120	33.04
TS5	32	44	A652 Bradford Road - Town Street signals	62	1876	32.43
TS1	26	45	A62 Huddersfield Road - Norristhorpe Lane signals	57	2022	32.24
	54	46	B6117 Walkley Ln - Station Ln	47	2458	32.01
	57	47	A6024 Woodhead Road - Station Road signals	64	1763	31.55
TS3	20	48	A629 Wakefield Road - Somerset Road signals	28	3797	29.66
TS1	78	49	A62 Gelderd Road - Highwood Road	56	1861	29.07
	43	50	A651 Oxford Road - A643 Spen Lane signals	54	1925	28.93

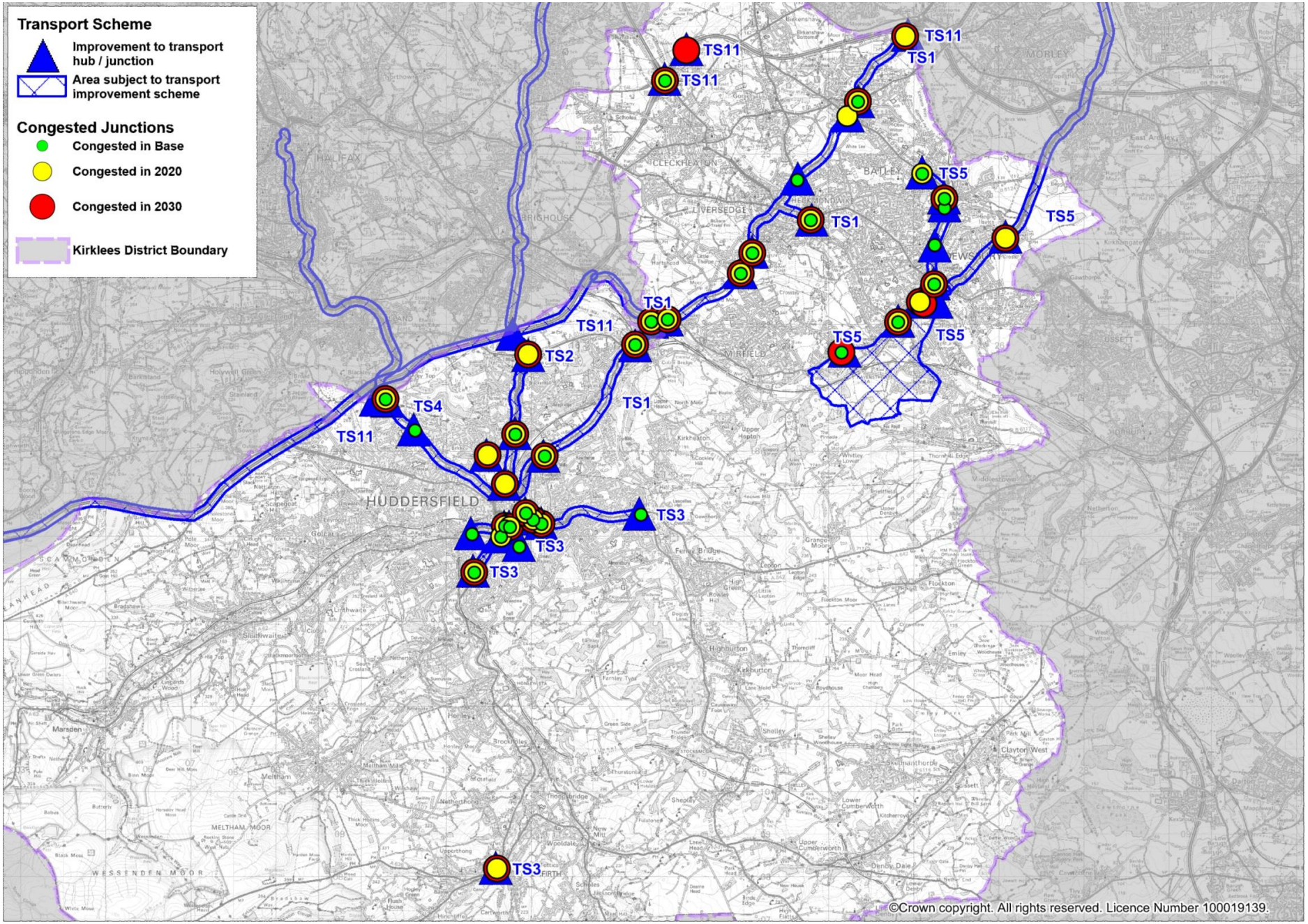
DM 2030 Scenario Junction Ranking.

TS Scheme	Base Rank	New Rank	Junction	DM 2030 Delay/veh (secs)	DM 2030 Flow	DM 2030 DELAY (Hrs)
TS11	1	1	M62 J26 - M606 Chain Bar	28	87292	690.55
TS4/11	2	2	Ainley Top	62	27505	470.84
TS1	3	3	Cooper Bridge	118	7857	256.75
TS1	4	4	A62 Leeds Road - A644 Huddersfield Road Three Nuns signals	316	2406	211.21
TS1	5	5	A62 Leeds Road - A6107 Bradley Road signals	171	3441	163.16
TS1	24	6	A62 Leeds Road - Sunny Bank Road signals	253	1901	133.53
TS1	34	7	A62 Leeds Road - Bradley Mills Road signals	171	2625	124.41
TS3	9	8	A62 Shorehead Roundabout	52	8205	119.45
TS3	8	9	A62 Queensgate - A616 Chapel Hill - A62 Manchester Road signals	112	3547	110.43
TS2	7	10	A641 Bradford Road - Spaines Road signals	126	3124	109.01
TS11	177	11	M62 EB east of Chain Bar	50	7781	108.71
TS2	48	12	A6107 Bradley Road - A641 Bradford Road roundabout	127	3032	107.10
TS3	11	13	A616 Lockwood Road - B6108 Meltham Road signals	125	2850	98.95
TS3	19	14	A629 Wakefield Road - B6432 St Andrew's Road signals	78	4474	96.93
TS1	6	15	A638 High Street - B6117 Market Street signals	163	2036	92.31
TS5	17	16	A653 Leeds Road - B6128 Challenge Way signals	133	2477	91.26
TS2	13	17	A62 Castlegate - St Johns Road - A641 Bradford Road signals	103	3107	88.81
TS5	10	18	A644 Huddersfield Road - Thornhill Road signals	91	3123	78.73
TS1	40	19	A62 Leeds Road - Stocks Bank Road signals	185	1419	73.09
TS1	23	20	A643 Leeds Road - A62 Gelderd Road - A62 Huddersfield Road signals	94	2695	70.15
TS5	35	21	A652 Bradford Road - B6123 Stocks Lane signals	84	2965	69.20
TS4	28	22	Wheathouse Rd - Blacker Rd signals	130	1842	66.31
TS5	12	23	A638 Dewsbury Ring Road - A638 Halifax Road signals	73	3132	63.91
TS3	18	24	A616 Chapel Hill - B6432 Colne Road signals	86	2672	63.52
TS5	62	25	A638 Wakefield Road - Syke Lane signals	88	2504	61.22
TS5	14	26	A644 Webster Hill - A638 Dewsbury Ring Road signals	75	2908	60.65
TS3	44	27	A6024 Huddersfield Road - A635 Victoria Street signals	167	1280	59.48
TS5	38	28	A652 Bradford Road - B6128 Station Road signals	67	3106	57.51
TS1	16	29	A652 Bradford Road - A62 Huddersfield Road Birstall Smithies signals	81	2554	57.42
TS3	21	30	A642 Wakefield Road - Waterloo Road signals	30	6296	52.93
TS5	47	31	A638 Webster Hill - Mill Street West signals	73	2576	52.16
TS4	30	32	A629 Halifax Road - Birkby Road signals	96	1819	48.41
TS5	33	33	A638 Dewsbury Ring Road - A638 Wakefield Road signals	46	3759	47.83
TS5	32	34	A652 Bradford Road - Town Street signals	88	1929	47.23
	57	35	A6024 Woodhead Road - Station Road signals	90	1864	46.51
TS3	41	36	A62 Manchester Road - Longroyd Lane signals	105	1583	46.35
TS5	27	37	A652 Bradford Road - B6128 Rouse Mill Lane signals	84	1968	46.09
	22	38	A62 Manchester Road - Morley Lane - Cowlersley Lane signals	129	1281	45.90
TS5	66	39	A638 Market St - Northgate signals	90	1775	44.34
TS1	25	40	A62 Leeds Road - Thistle Street signals	67	2331	43.54
TS2	15	41	A641 Bradford Road - Willow Lane East signals	50	2953	41.24
TS5	37	42	A638 Dewsbury Ring Road - A653 Leeds Road signals	51	2890	41.14
TS5	29	43	Ravensthorpe Gyratory	18	8097	40.77

TS Scheme	Base Rank	New Rank	Junction	DM 2030 Delay/veh (secs)	DM 2030 Flow	DM 2030 DELAY (Hrs)
TS5	45	44	A638 Aldams Road - B6409 Wilton Street signals	85	1711	40.51
TS5	131	45	B6117 Slaithwaite Road - Headfield Road	64	2221	39.36
	125	46	Church St - Thornhill Rd	78	1803	39.23
TS3	71	47	A62 Queensgate - Alfred Street signals	70	1995	39.03
TS3	20	48	A629 Wakefield Road - Somerset Road signals	33	4054	36.73
TS1	26	49	A62 Huddersfield Road - Norristhorpe Lane signals	63	2062	35.92
	59	50	B6123 Batley Road - B6122 White Lee Road signals	108	1143	34.29

Appendix E

Do Something Scenario and Transport Mitigation Strategy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Improvement to transport hub / junction
Area subject to transport improvement scheme
Congested Junctions
Congested in Base
Congested in 2020
Congested in 2030
Kirklees District Boundary
TS11
TS1
TS5
TS2
TS4
TS3
HUDDERSFIELD
HALIFAX
BRIGHOUSE
CLECKHEATON
LIVERSEDGE
BATLEY
MORLEY
MIRFIELD
Kirkheaton
Upper Hopton
Ferny Bridge
Grange Moor
Flockton
Highburton
Kirkburton
Shelley
Clayton West
Skelmanthorpe
Denby Dale
Marsden
Meltham
MELTHAM MOOR
WESSENDEN MOOR
Slaithwaite
Scammonden
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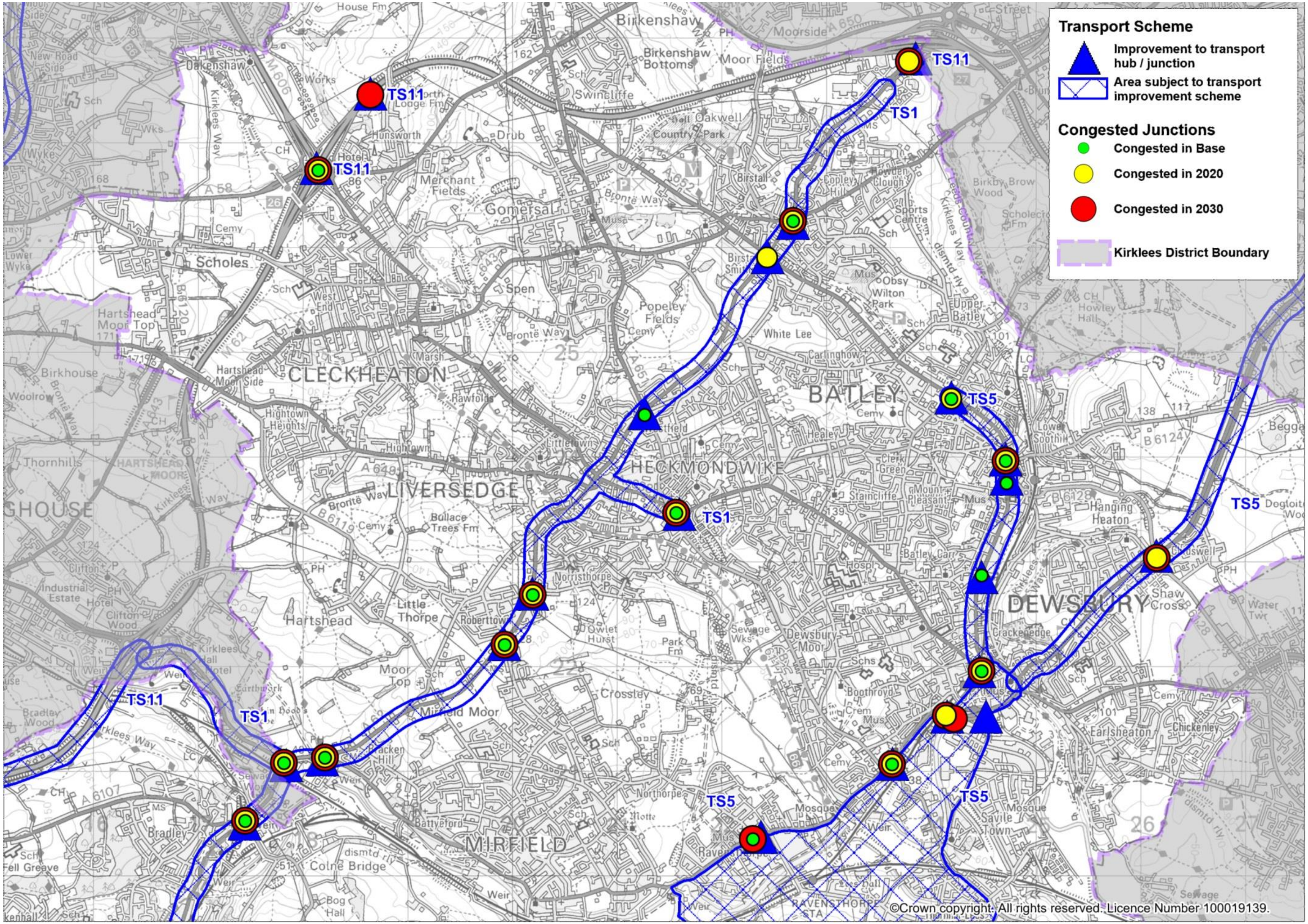
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Improvement to transport hub / junction
Area subject to transport improvement scheme
Congested Junctions
Congested in Base
Congested in 2020
Congested in 2030
Kirklees District Boundary
TS11
TS1
TS5
CLECKHEATON
LIVERSEDGE
HECKMONDWIKE
BATLEY
DEWSBURY
MIRFIELD
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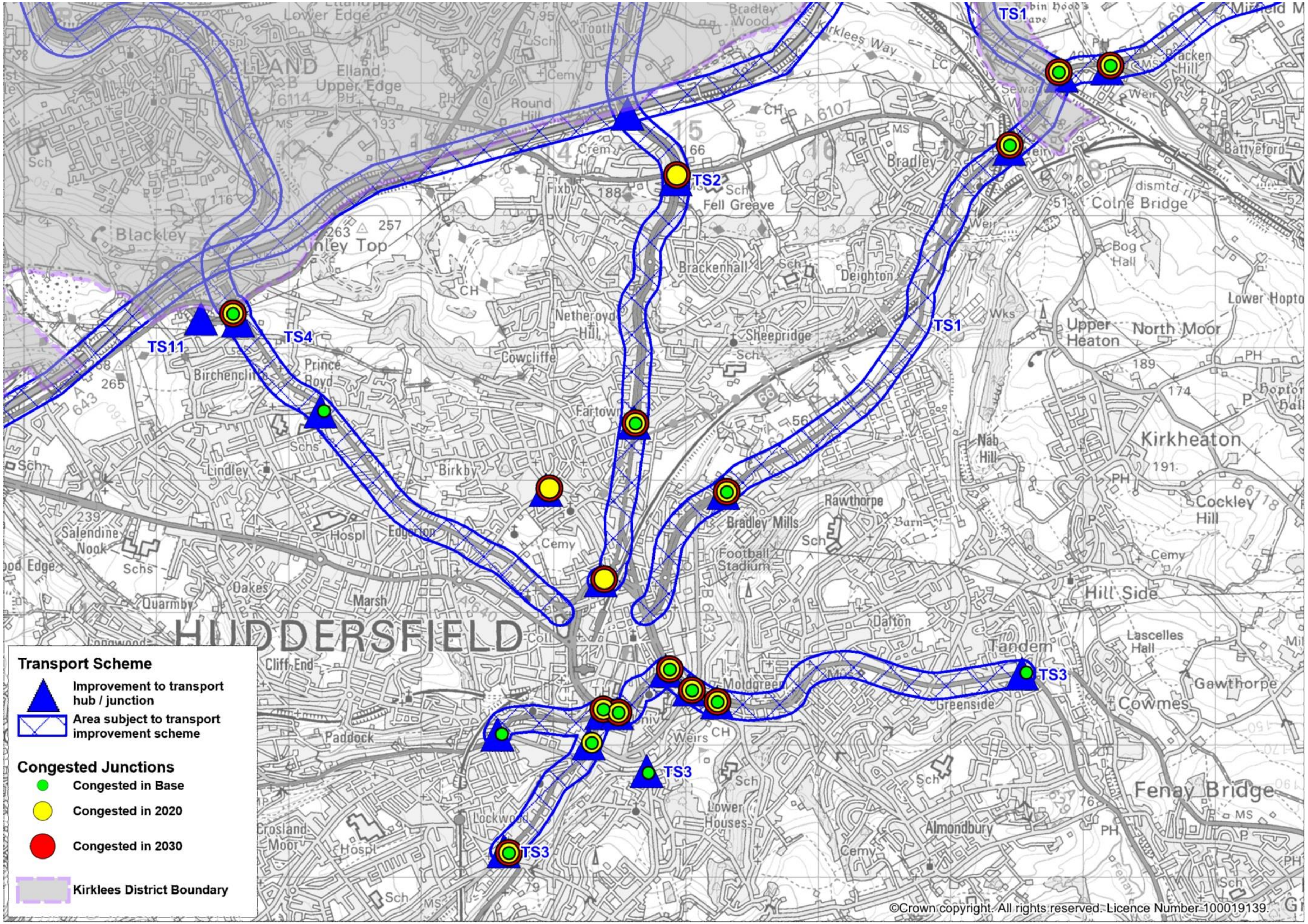
Transport Scheme
Improvement to transport hub / junction
Area subject to transport improvement scheme
Congested Junctions
Congested in Base
Congested in 2020
Congested in 2030
Kirklees District Boundary
TS1
TS1
TS2
TS3
TS3
TS3
TS4
TS11
HUDDERSFIELD
ELLAND
Fixby
Fell Greave
Bradley
Colne Bridge
Brackenhall
Deighton
Sheepridge
Netheroyd Hill
Cowcliffe
Fartown
Birkby
Lindley
Birchencliffe
Prince Royd
Ainley Top
Blackley
Upper Heaton
North Moor
Kirkheaton
Rawthorpe
Bradley Mills
Cockley Hill
Hill Side
Dalton
Tandem
Lascelles Hall
Gawthorpe
Cowmes
Moldgreen
Greenside
Fenay Bridge
Almondbury
Lower Houses
Lockwood
Paddock
Marsh
Oakes
Quarmby
Salendine Nook
Edgerton
Cliff End
Crosland Moor
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Addendum

Transport Schemes
Delivery Statement

Introduction

10.1 The purpose of this addendum is to clarify some of the issues around deliverability of the major transport schemes contained within the TS corridors identified in table 3 on page 12 to support either strategic housing and employment allocations or large clusters of land use allocations across the district where it is known that there are existing levels of congestion.

10.2 The geographic areas under consideration are:

Table 5: Significant Local Plan allocations grouped into Geographic areas

Geographic Area	Significant* Local Plan Allocations
Cooper Bridge	• Cooper Bridge (E1832c) • Bradley Golf Course (H1747 and H351) • Bradley Business Park (E1836) • Land at Slipper Lane (MX1929)
Chidswell	• Land East of Leeds Rd (MX1905) • Land off Soothill Lane (H758) • Land to South West of Dewsbury Rams (H46)
South Dewsbury	• Land to the south of Ravensthorpe Rd (H2089) • Land to the north west of Forge Lane (H269) • Lock Street (H2646)
South Huddersfield	• Land North of Blackmoorfoot Rd (MX1930) • Land North of Blackmoorfoot Rd (H481) • Land East of Thewlis Lane (H1783) • Land South of the Lodge (H1776) • Land south of Blackmoorfoot Rd (MX1903) • Land East of Netherton Moor Road (H660)
Lepton	• Minerva Works (H2594a) • Land west of Stead Lane (H737) • Land to the south east of Knowle Road (H3350) • Land north of Fenay Lane (H1679) • Land west of Oak Tree Road (H684) • Land to the north west of Woodsome Drive (H31) • Land adjacent Penistone Road/Woodsome Park (H2684a) • Land to the south east Hermitage Park (H2730a)
Holmfirth	• Land to the east of, Holme View Avenue (H284) • Land to the South of Water Street (H2585) • Land north-east of, Bottoms Mill (E1871) • Land to the south of, Vicarage Meadows (H47) • Land to the south of Sandy Gate (H597) • Land to the east of Ryecroft Lane (H297)

Note that ALL local Plan allocations have been modelled; the table lists the significant allocations in the “area” designation from column 1

10.3 Within each of these geographic areas, there are a number of major junction/highway improvement works that the Council considers it important to show how both from a funding and practical feasibility perspective, they can be bought forward.

10.4 The following table lists the schemes where further clarification is being presented in this addendum:

Table 6: Major Transport Schemes in identified geographic areas

Area	Major Transport Scheme
Cooper Bridge	Cooper Bridge Transport Scheme, between the junction of the A62/A6106/B6118 and a point along the A644 Wakefield Rd between Cooper Bridge and the M62 J25
Chidswell	A653/B6128 Shaw Cross
South Dewsbury	Selected junction improvements (Drawing 4)
South Huddersfield	A62/B6432 Longroyd Bridge A616/B6108 Lockwood Bar
Lepton	A629/A642 Waterloo
Holmfirth	A6024/A653 Victoria Street

10.5 Under funding feasibility, the following points will be addressed:

- How is the scheme going to be funded?
- Is the funding likely to be secured? What information do we have that can help show that?
- Is the fundi ng likely to be in place within the plan period?
- What is the process for securing funding?

10.6 Under practical feasibility the following points will be addressed:

- What is the scheme?
- Where the scheme is suitably developed, can it delivered from an engineering perspective?
- Does the likely design give adequate capacity to support the plans proposed allocations?

Funding

Background

10.7 It is proposed to deliver all of the major transport schemes highlighted above through different programmes within the West Yorkshire Transport Fund (WYTF).

10.8 As part of the 'City Deal' between West Yorkshire, York and central government, a new Transport Fund in excess of £1bn targeted specifically to increasing housing, employment and economic growth across the region has

been created. (Leeds City Region, Local Enterprise Partnership: Strategic Economic Plan 2014, Part A, p53).

10.9 The Leeds City Region Economic Plan 2016 to 2036 has 4 strategic priorities required to achieve “good growth”. Good growth is defined as: “achieving both the right quantity and the right quality of growth; creating a strong, productive and resilient economy where a radical uplift in business competitiveness, productivity and profits goes hand in hand with access to good jobs that pay higher wages, and where all residents have access to opportunity and enjoy improved quality of life.

10.10 The aim of priority 4, “infrastructure for growth” is “to build a 21st century physical and digital infrastructure that supports the City Region to grow and compete globally; and to do this in a way that enhances places, transforms connectivity, maximises GVA benefits, minimises carbon impacts, and enables all businesses, people and places to have access to opportunities”

10.11 Kirklees Council has determined its own West Yorkshire Transport Fund priorities by seeking to align them with its economic growth agenda contained within its local plan, thus ensuring the Transport Fund can bring forward housing growth by providing access to development sites and support employment through the reduction of transport costs to business and commuters. This will create jobs as well as improving the accessibility of existing employment sites and better connecting business with markets and other businesses.

10.12 More specifically, the potential schemes in Kirklees will open up key development sites, expand the connectivity into Huddersfield and Dewsbury, and enable Kirklees residents to access employment opportunities across West Yorkshire, improve journey times and tackle congestion on routes to/from the motorway network, particularly for freight

10.13 To facilitate the delivery of the strategic allocations or the clusters of land use allocations, Kirklees has identified and developed within the Transport Fund a number of Core Projects (West Yorkshire Combined Authority. (2015). *West Yorkshire 'Plus' Transport Fund*. Retrieved from http://www.westyorks-ca.gov.uk/wytf/)

10.14 ‘Core projects’ are seen within the fund as those which are the catalysts and enablers of change, have the greatest direct short term economic impact (in terms of jobs supported per £ invested), and generate funding to reinvest in other ‘more transformational’ projects.

10.15 Further details on the core projects and their impact on the Kirklees economy can be found in the core document: “Kirklees Council Cabinet: West Yorkshire Plus’ Transport Fund”, dated 25th April 2013. The following table shows how the Major Transport schemes detailed in table 6 above fit into the West Yorkshire Transport Fund core projects:

Table 7: Local Major Transport Schemes and West Yorkshire Transport Fund Programmes

Major Transport Scheme	West Yorkshire Transport Fund Programme
Cooper Bridge Transport Scheme, between the junction of the A62/A6106/B6118 and a point along the A644 Wakefield Rd between Cooper Bridge and the M62 J25	Cooper Bridge Core Project http://www.westyorks-ca.gov.uk/transport/wytf/projects/cooper-bridge/
A653/B6128 Shaw Cross	M2D2L Core Project http://www.westyorks-ca.gov.uk/transport/wytf/projects/a653/
A62/B6432 Longroyd Bridge A616/B6108 Lockwood Bar	Corridor Improvement Programme (CIP) Emerging. Further details to be provided.
A629/A642 Waterloo	Corridor Improvement Programme (CIP) Emerging. Further details to be provided.
A6024/A653 Victoria Street	Corridor Improvement Programme (CIP) Emerging. Further details to be provided.

Funding Process

10.16 Testing of the above schemes (including the Corridor Improvement Programme as a whole across West Yorkshire) as part of the development of the Fund, showed that there was the potential for the following impacts: Table 9

Kirklees Year	**2024**	**2030**	**2036**
Additional jobs in Kirklees	2000	2528	2912
Additional GVA (per year)	£122m	£165	£185
Additional residents in employment	2140	2600	2940

10.17 Whilst this initial testing was sufficient to designate each transport scheme as a priority project in the WYTF, this is in itself no guarantee of full funding coming forward. Like any form of public investment, there must be demonstrable evidence that the benefits of each individual a scheme outweigh the costs.

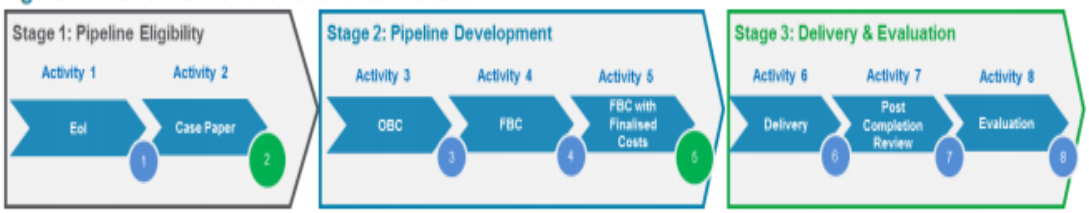
10.18 The body that is accountable with regard to the Leeds City Region Growth Deal Funding, the West Yorkshire Combined Authority is part of an Assurance Framework developed by the Leeds City Region (Leeds City Region 2017 p4)

10.19 This Assurance Framework covers capital and significant revenue expenditure funded by Government or local sources and invested by WYCA in projects and programmes. The Assurance Framework sets out arrangements adopted by the LCR in relation to:

- governance and key decision-making, including how transparency and accountable decision making is promoted and delivered
- processes used to prioritise
- assurance around project and programme delivery, including our approach ensuring value for money; and
- approach to monitoring and evaluation

10.20 As set out in detail in Section 4 of the Assurance Framework, all schemes requiring investment go through a 3 Stage Assurance Process. The process has (depending on the scheme), up to 8 Decision Points and as a scheme progresses through the Assurance Process, decisions are made at each of these points about whether or not a scheme should progress and what the requirements for a scheme should be in its development. This includes any funding for scheme development and the final funding agreement.

Figure 2.1: Overview of the Assurance Process



10.21 Decisions on transport investment are informed by evidence set out in a business case. Business cases are developed in line with Treasury's advice on evidence-based decision making set out in the Green Book and use its best practice five case model approach.

This approach shows whether schemes:

- are supported by a robust case for change that fits with wider public policy objectives – the 'strategic case';
- demonstrate value for money – the 'economic case';
- are commercially viable – the 'commercial case';
- are financially affordable – the 'financial case'; and
- are achievable – the 'management case'.

10.22 All schemes are currently progressing through to stage 2, decision point 3: "Outline Business Case. The outline business case concentrates on detailed assessment of the options to find the best solution. Full economic and financial appraisals take place during this phase (building up the economic and financial cases), a preferred option is selected and, where relevant, preparations are made for the potential contract through the development of

the commercial case. The arrangements required to ensure successful delivery are set out in the management case.

10.23 The following table shows the current delivery plan as drawn up by Kirklees Council for each of the schemes:

Table 8: Kirklees West Yorkshire Transport Fund Delivery Timescales

West Yorkshire Transport Fund Scheme	OBC Commence	FBC Commence	Delivery Commence	Construction Period
Core Project: Cooper Bridge Relief Road	Q4 17/18	Q4 18/19	Post 2021	18 Months
Core Project: Cooper Bridge A644 Dualling:			Pre 2021	9 months
Core Project: Cooper Bridge Roundabout and Three Nuns junction			Post 2021	18 months
Core Project M2D2L (Shaw Cross)	Q3 18/19	Q3 19/20	Post 2021	9 months
CIP Longroyd Bridge	Q3 18/19	Q3 19/20	Post 2021	12 months
CIP Lockwood Bar	Q3 17/18	Q3 18/19	Pre 2021	9 months
CIP Waterloo	Q3 18/19	Q3 19/20	Post 2021	6 months
CIP Holmfirth	Q3 17/18	Q3 18/19	Pre 2021	9 months

Practical Feasibility

10.24 This section of the addendum will, for each geographic area, answer the following questions:

- If there is a physical scheme that is suitably developed, can it be delivered from an engineering perspective?
- Does the likely design or strategy give adequate capacity to support the plans proposed allocations?

10.25 With respect to the second bullet point, the Council has used district wide traffic model and set up a series of cordons that coincide with the geographic areas described in Table 5, page 40 of this addendum. The cordons are presented as part of the discussion around each specific geographic area.

10.26 The model has been run for the following scenarios:

- Base
- Do Nothing 2020 (5 years Local Plan development and no transport schemes)
- Do something 2020(5 years Local Plan development and no transport schemes)
- Do Nothing 2030 (15 years Local Plan development and no transport schemes)

- Do something 2030(15 years Local Plan development and no transport schemes)

  A definition of each scenario can be found in table1, page 7 of the main Technical Paper.

10.27 In order to undertake meaningful comparisons between scenarios the following indicators have been reported on for each scenario:

- Number of trips originating, ending or passing through the cordon, measured in passenger carrying units[4]
- Total delay in hours within the cordon
- Delay per trip (in seconds per passenger carrying units) within the cordon

10.28 The indicators can be used to understand in more detail than at a strategic level (as presented in the main Technical Paper) whether the schemes proposed provide adequate capacity to support the allocations in the cordons, taking into account the allocations and interactions with other transport schemes proposed across the plan as a whole.

10.29 The last point is particularly important as it must be noted that there is no priority assigned to the introduction of particular schemes within the complete mitigation strategy. Therefore it is assumed that by 2030, all the modelled schemes presented in table 1 on page 7 of the main Technical Paper have been implemented.

I. Cooper Bridge

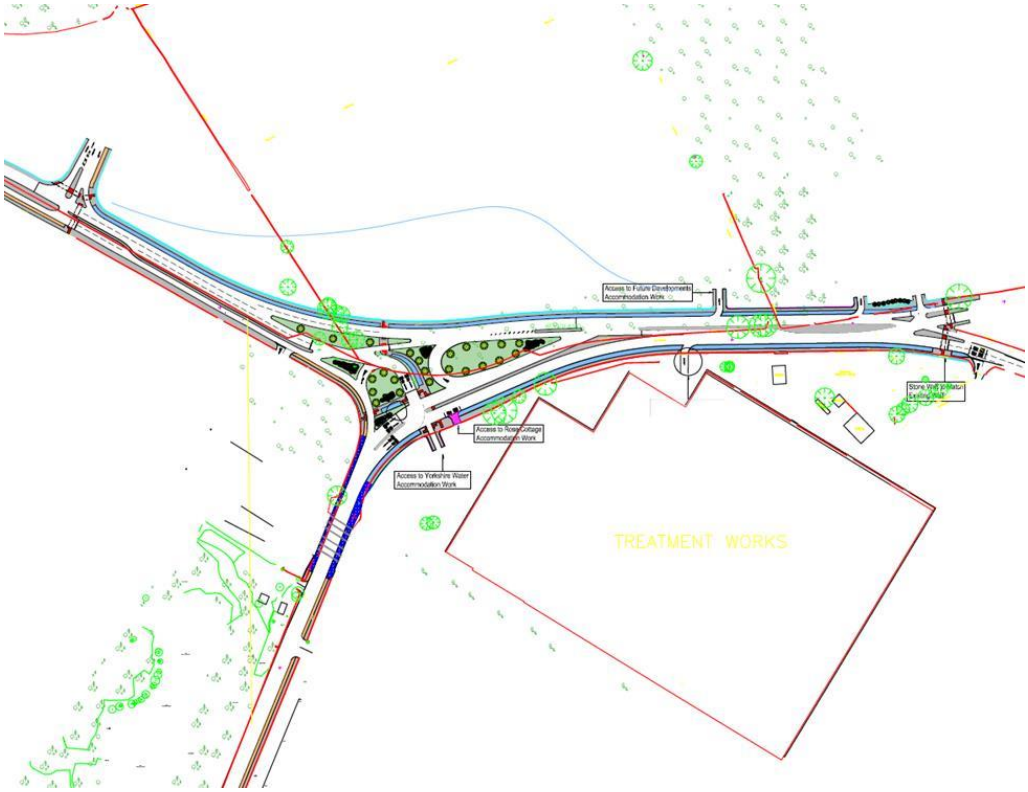
10.30 The Cooper Bridge highway scheme that is currently under consideration within the Transport Fund can be described as follows:

- Highway improvement works to the junction of A62 Cooper Bridge Road, A644 Wakefield Road, A62 Leeds Road (incorporating the 'Three Nuns' junction);
- Widening of the A644 Wakefield Road between the M62 junction 25 and Cooper Bridge
- Highway improvement works to the junction of Bradley Road / Colne Bridge Road (incorporating Oak Road) and construction of the Bradley Link (Bradley to the A644 Wakefield Road);

10.31 The drawing below shows the highway improvement works to the junction of A62 Cooper Bridge Road, A644 Wakefield Road, A62 Leeds Road (incorporating the 'Three Nuns' junction).

[4] Traffic is composed of various types of vehicles, the range and relative composition of which can vary from location to location. Traffic modelling software frequently utilises a common unit, known as the Passenger Car Unit (PCU), to represent general traffic. Common vehicle types are assigned a conversion factor so that an equivalent PCU value can be generated from classified vehicle data collected. Nominally 1 PCU is 5.75m

Drawing 1: Highway Improvements to Cooper Bridge

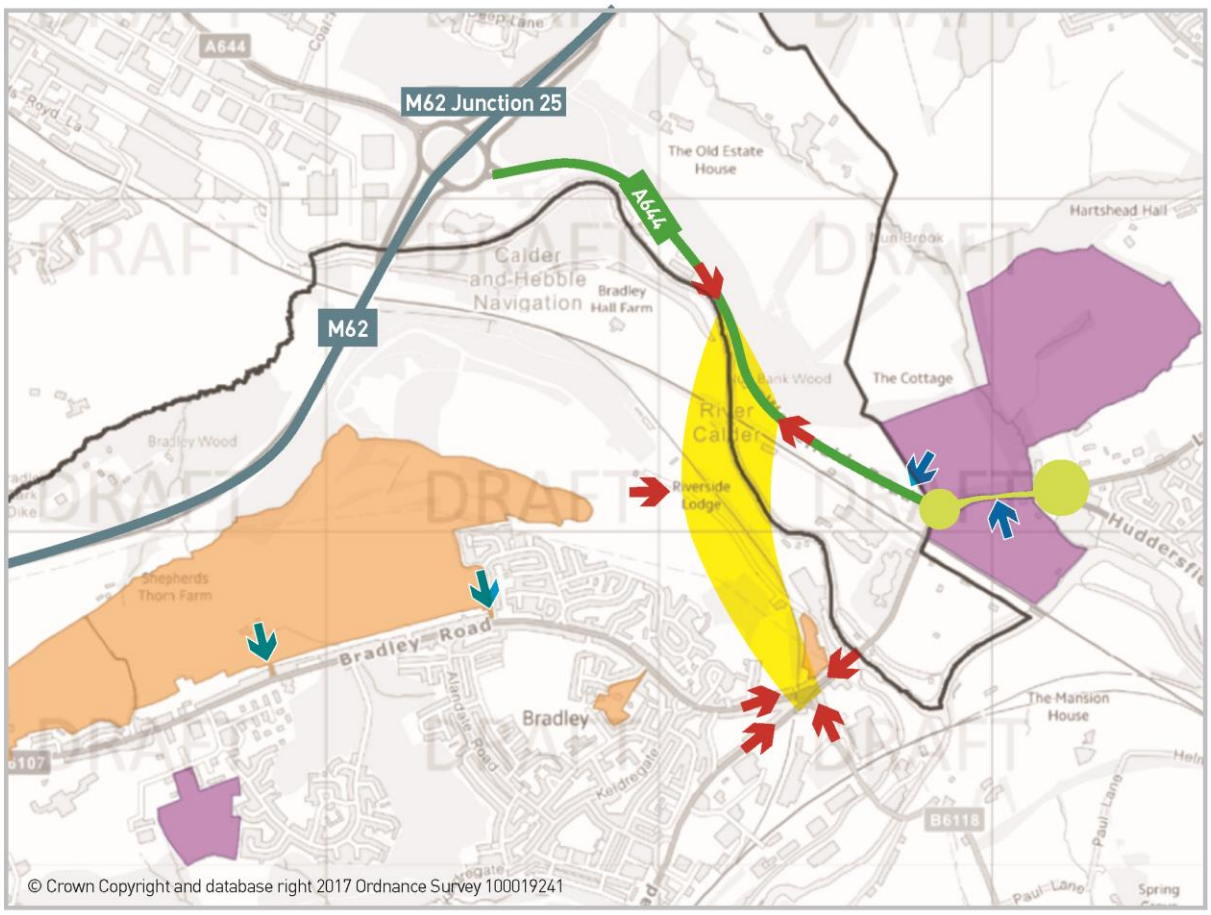


10.32 The following drawing shows the area of interest for the highway improvement works in relation to local plan allocations (housing, employment and mixed use allocation) to the junction of Bradley Road / Colne Bridge Road (incorporating Oak Road) and construction of the Cooper Bridge Relief Road (Bradley to the A644 Wakefield Road). It also shows the section of the A644 that is currently proposed to be converted to dual carriageway. Note that this drawing only shows major junction improvements as identified through the Council's strategic transport modelling. It is expected that through the planning process, other more localised transport and highway improvements will be pursued if required

Drawing 2:

Kirklees Local Plan Cooper Bridge and Bradley Area allocations - delivery.

Draft Highway Schemes



Key

- Local Plan proposed Housing Allocation
- Local Plan proposed Employment Allocation
- Proposed 'Bradley Link' Corridor of interest
- Primary highway access to Bradley Link
- Local Plan site access
- Proposed Widening of the A644
- Major Junction/Highway Improvement Works

10.33 With respect the design of the scheme the following has been undertaken:

- Desktop geotechnical survey for the link road
- Structural design at preliminary detail (horizontal and vertical alignment based on topographical surveys), focussing on three options to cross the railway line and water courses.
- Highway designs at preliminary detail (horizontal and vertical alignments based on topographical surveys)

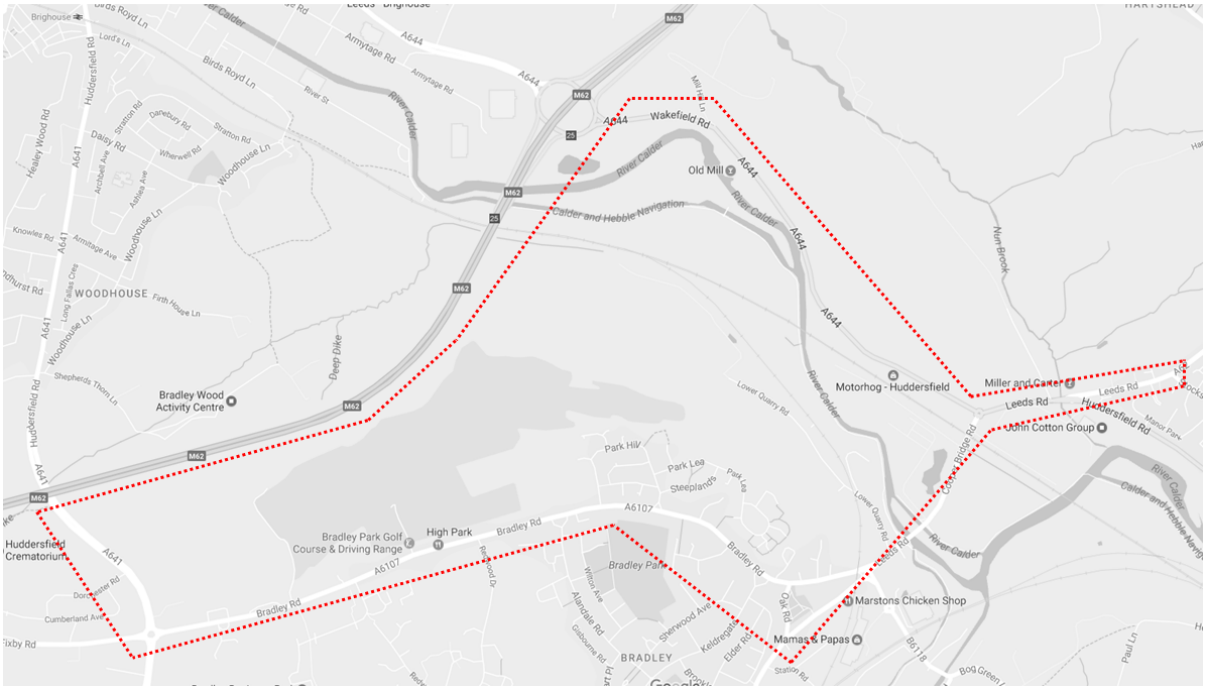
10.34 The following design elements are still to be undertaken and are programmed in for quarters 2 and 3, 2017/2018:

- Detailed microsimulation modelling to determine the precise capacity requirements of junctions and links
- Invasive surveys to determine detailed structural requirements
- Land based environmental surveys/studies

Capacity Calculations

10.35 As noted earlier a cordon coincident with the geographic area defined in table 5, page 40 was overlaid in the Council's traffic model. The drawing below shows the extent of the cordon.

Drawing 3 Cooper Bridge Delay Cordon



10.36 From the cordon, the total number of trips originating, ending and passing through it was calculated as was the total delay in the following scenarios:

The results from this analysis are as follows in the AM:

Table 9

Cooper Bridge Area	Cordon Trips	Total Delay (Hr)	Delay per Trip (sec)
Base	6,391	351	198
Do Minimum 2020	7,720	624	291
Do Something 2020	7,695	657	307
Do Minimum 2030	8,630	845	353
Do Something 2030	11,227	752	241

The PM results are:

Table 10

Cooper Bridge Area	Cordon Trips	Total Delay (Hr)	Delay per Trip (sec)
Base	6,407	278	156
Do Minimum 2020	8,145	603	266
Do Something 2020	8,156	630	278
Do Minimum 2030	9,575	876	329
Do Something 2030	12,272	881	258

10.37 From the results presented above and an understanding that the Cooper Bridge transport scheme would be in place post-2020, it can be seen that both the number of trips within and through the cordon increases in all scenarios.

10.38 What is interesting is the large increase between the Do minimum 2030 and the Do something 2030. This is because the scheme provides a large amount of capacity for use by the development, but also for traffic that reassigns through this area as a result of the capacity improvements. As a result of this reassignment, delays per trip do increase from the “base” scenario but the key thing to note is that thee decrease of 111 seconds in 2030 as a result of the scheme introduction in 2030.

10.39 This work shows that the transport scheme at Cooper Bridge caters not only for the development traffic in the immediate locality around Cooper Bridge but for the traffic associated with the provision of 31,000 homes as part of the Kirklees Local Plan.

II. South Dewsbury

10.40 The South Dewsbury highway scheme that is currently under consideration within the Transport Fund can be described, but not limited to:

Highway improvement works to the junctions of

- Rishworth Road / Aldhams Road / Savile Road (B6409)
- Mill Street East / Mill Street West / Savile Road
- Thornhill Road / Forge Lane / Savile Road
- A644 / A638 / Aldhams Road
- A644 / B6117

Ravensthorpe Transport Improvement Zone

- The Ravensthorpe Transport Improvement Zone will include the provision of effective road connections to improve connectivity and reducing congestion. The new road capacity will rebalance the

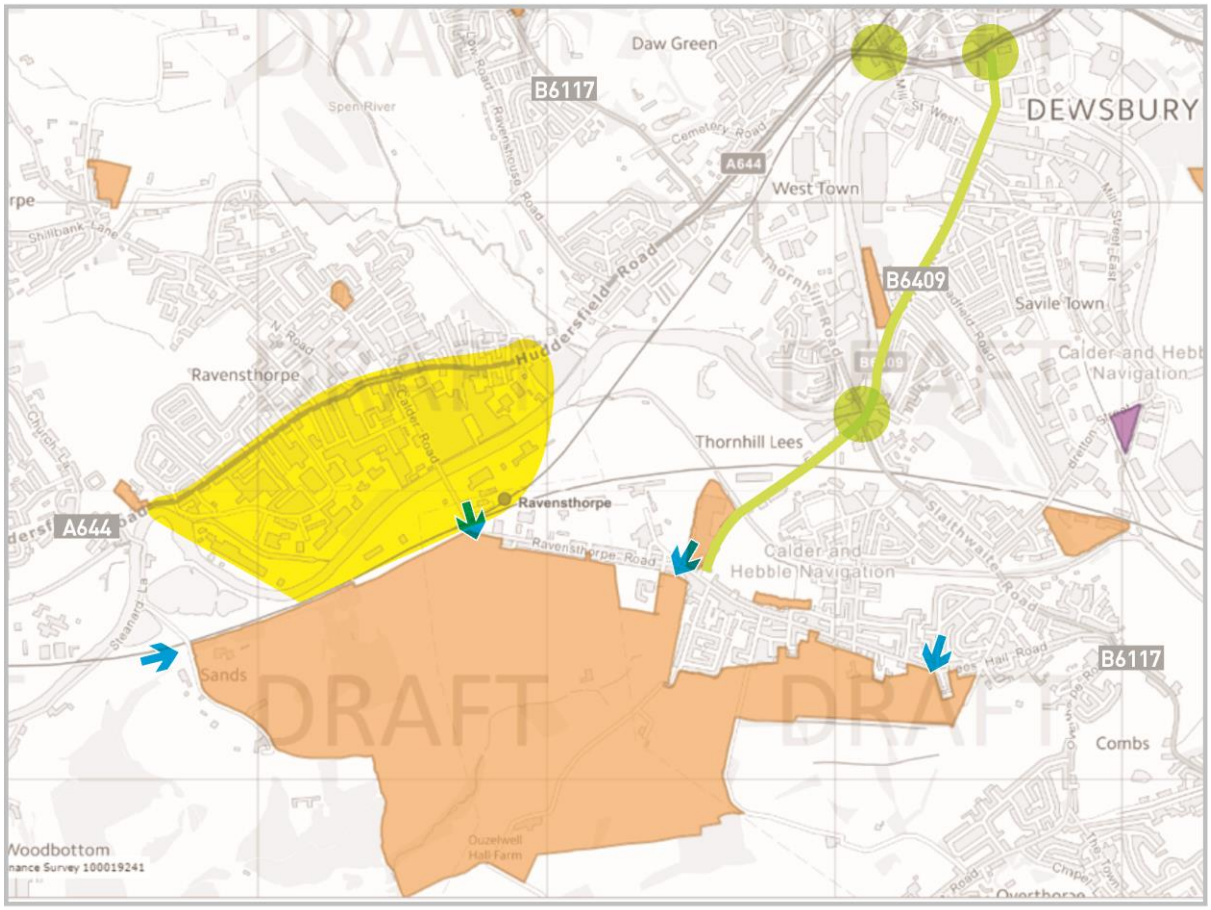
transportation infrastructure within Ravensthorpe delivering local sustainable transport and economic goals.

10.41 The following drawing shows the area of interest for the highway improvement works in relation to local plan allocations (housing, employment and mixed use allocation) in the South Dewsbury Area. It also shows the Ravensthorpe Transport Improvement Zone. Note that this drawing only shows junction improvements as identified through the Council's strategic transport modelling. It is expected that through the planning process, other more localised transport and highway improvements will be pursued if required.

Drawing 4:

Kirklees Local Plan South Dewsbury Area allocations - delivery

Draft Highway Schemes



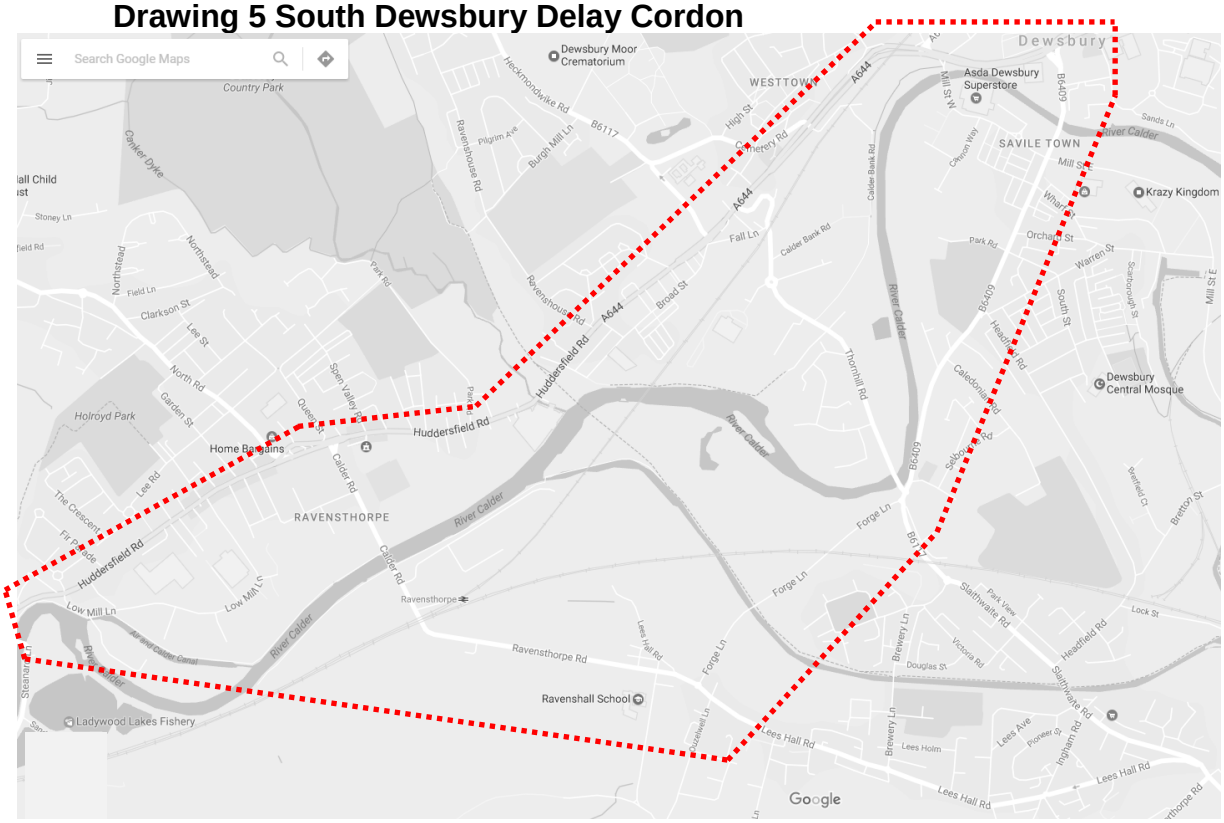
Key

- Local Plan proposed Housing Allocation
- Local Plan proposed Employment Allocation
- Transport Improvement Zone
- Major Junction/Highway Improvement Works
- Local Plan site access

10.41 **Capacity Calculations**

As noted earlier a cordon coincident with the geographic area defined in table 5, page 40 was overlaid in the Council's traffic model. The drawing below shows the extent of the cordon with South Dewsbury.

Drawing 5 South Dewsbury Delay Cordon



10.42 From the cordon, the total number of trips originating, ending and passing through it was calculated as was the total delay in the following scenarios:

The results from this analysis are as follows in the AM:

Table 11

South Dewsbury Area	Cordon Trips	Total Delay (Hr)	Delay per Trip (sec)
Base	6728	205	110
Do Minimum 2020	8599	446	187
Do Something 2020	8729	506	209
Do Minimum 2030	9619	537	201
Do Something 2030	10211	435	153

The PM results are:

Table 12

South Dewsbury Area	Cordon Trips	Total Delay (Hr)	Delay per Trip (sec)
Base	6368	163	92

Do Minimum 2020	8460	372	159
Do Something 2020	8715	589	243
Do Minimum 2030	9880	725	264
Do Something 2030	10594	542	184

10.43 From the results presented above and an understanding that the majority of the transport scheme would be in place post-2020, it can be seen that both the number of trips within and through the cordon increases in all scenarios.

10.44 In the 2030 AM scenario, with no highway or transport improvement schemes in place, cordon trips (within and passing through) increase by 43% when compared with the base. The corresponding delay per trip indicator shows increases of 83% from 110 seconds to 201 seconds. However with the scheme in place (again in 2030), total cordon trips increases by 52% as a result of traffic from elsewhere in the model making use of the capacity, but delay per trip only increase by 40% from 110 to 153.

10.45 It is accepted that 40% still represents a not insubstantial increase, but a delay per trip of 153 seconds is less than the delay per trip in 2020, which is 187seconds.

10.46 The situation in the 2030 PM scenarios is slightly less positive, with cordon trips increasing by 55% between the base and 2030 with no highway improvements schemes in place and by 66% with improvements and the Transport Zone in place. The corresponding delay per trip indicator shows a 187% increase from 92 seconds to 264 seconds between the base and 2030 with no schemes, but only (comparatively speaking) a 100% increase (92 seconds to 184 seconds) with the scheme in place.

10.47 Whilst 100% increase in delay is certainly significant, the figure of 184 seconds is only 25 seconds more than the corresponding delay per trip in 2020 with no schemes in place.

10.48 These figures show that whilst there will be delay on the network around South Dewsbury as a result of the biggest allocation in Local Plan AND substantial amounts of induced traffic using the improvements and those district-wide[5], the identified schemes go a long way to ensuring that the existing transport network can accommodate 5 years growth with users experiencing a certain level of delay. However the subsequent 10 years shows substantial little deterioration in delay per trip.

[5] In these calculations other traffic schemes out with the cordon and in the model are in place and are therefore influencing the route choice in the simulation. Therefore there will be most certainly be induced traffic making use of the capacity afforded by the improvements. Induced traffic is widespread reassignment of traffic note in the cordon, based on the theory of induced demand: the phenomenon that after supply increases, more of a good is consumed.

10.49 This shows that the identified interventions in the South Dewsbury area cater not only for the development traffic in the immediate locality around South Dewsbury but for the traffic associated with the provision of 31,000 homes as part of the Kirklees Local Plan.

III. Chidswell

10.50 The Chidswell highway scheme that is currently under consideration within the Transport Fund can be described as follows:

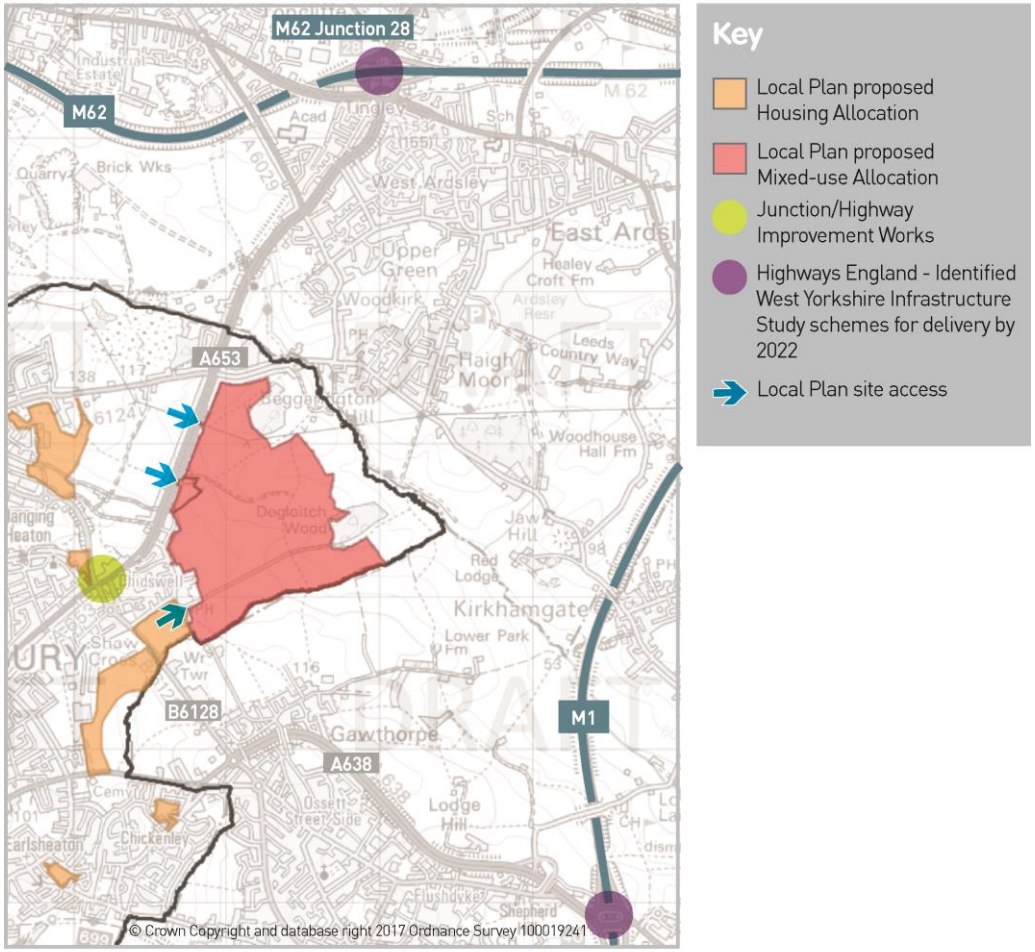
- Replacement of the existing signal controlled junction at Shaw Cross with a gyratory with capacity controlled in part by signalised crossing facilities with inductive loops on the highway.

10.51 The following drawing shows the area of interest for the highway improvement works in relation to local plan allocations (housing, employment and mixed use allocation) in the North East Dewsbury (Chidswell) Area. It also shows selected Highways England Strategic Route Network junction improvements. Note that this drawing only shows junction improvements as identified through the Council's strategic transport modelling. It is expected that through the planning process, other more localised transport and highway improvements will be pursued if required

Drawing 6:

Kirklees Local Plan North East Dewsbury (Chidswell) Area allocations - delivery

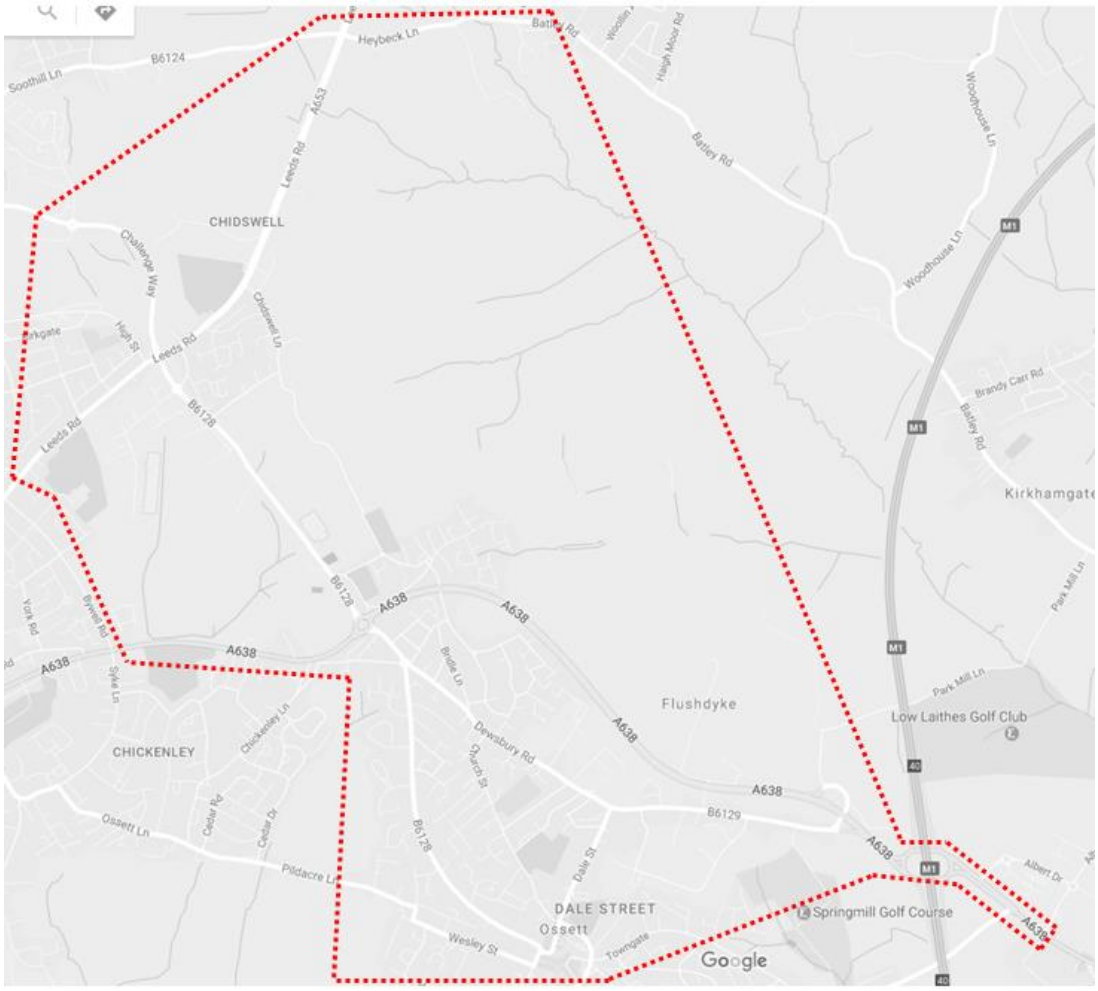
Draft Highway Schemes



Capacity Calculations

10.52 As noted earlier a cordon coincident with the geographic area defined in table 5, page 40 was overlaid in the Council's traffic model. The drawing overleaf shows the extent of the cordon.

Drawing 7 North East Dewsbury (Chidswell) Delay Cordon



10.53 From the cordon, the total number of trips originating, ending and passing through it was calculated as was the total delay in the following scenarios:

The results from this analysis are as follows in the AM:

Table 13

Chidswell Area	Cordon Trips	Total Delay (Hr)	Delay per Trip (sec)
Base	9,138	139	55
Do Minimum 2020	12,441	260	75
Do Something 2020	12,319	293	86
Do Minimum 2030	14,462	552	137
Do Something 2030	14,533	457	113

The PM results are:

Table 14

Chidswell Area	Cordon Trips	Total Delay (Hr)	Delay per Trip (sec)
Base	9,597	161	60

Do Minimum 2020	13,168	346	94
Do Something 2020	12,954	322	89
Do Minimum 2030	15,097	623	149
Do Something 2030	15,524	269	64

10.54 In the 2030 AM scenario, with no highway or transport improvement schemes in place, cordon trips (within and passing through) increase by 58% when compared with the base. The corresponding delay per trip indicator shows increases of 151% from 139 seconds to 552 seconds. However with the scheme in place (again in 2030), delay per trip drops from 552 seconds to 457 seconds, a decrease of 30%

10.55 The situation in the 2030 PM scenarios is more positive, with cordon trips increasing by 55% between the base and 2030 with no highway improvements schemes in place and by 59% with improvements in place. The corresponding delay per trip indicator shows a 146% increase from 60 seconds to 149 seconds between the base and 2030 with no schemes, but only a 5% increase (92 seconds to 184 seconds) with the scheme in place.

10.56 With respect to the AM calculations, whilst 107% increase in delay is certainly significant, the delay per trip is only 113 seconds, i.e. less than 2 minutes and certainly not a figure that could be classed as “severe”

10.57 These figures show that whilst there will be delay on the network around South Dewsbury as a result of one of the biggest allocation in Local Plan AND substantial amounts of induced traffic using the improvements and those district-wide, the identified scheme goes a long way to ensuring that the existing transport network can accommodate the full Local Pan development aspirations over 15 years.

IV. South Huddersfield

10.58 This geographic area sees the proposal for two separate schemes at two major intersections that facilitate movements from South Kirklees to Huddersfield and destinations beyond.

Longroyd Bridge

10.59 This junction serves effectively as a gateway to Huddersfield but is currently a poorly defined, understated area of townscape, characterised by small / medium sized businesses - many of which are vacant and/or derelict. The existing junction arrangement already results in queuing and delay, and is one of the top 50 most congested intersections in West Yorkshire.

10.60 There is potential for 2,000 new homes and 1,200 new jobs to be created in the Colne Valley and Crosland Moor & Netherton wards over the next 15 years through delivery of the emerging Kirklees Local Plan but it is clear that this growth cannot be realised without significant transport infrastructure investment at Longroyd Bridge.

The scheme involves:

- Increasing the capacity of Longroyd Lane
- Removing the staggered movement for vehicles looking to travel from Longroyd Lane to St Thomas' Rd and vice-versa, thereby substantially increasing the capacity of the junction
- Facilitating new and emerging developments;
- Enhancing blue and green infrastructure;
- Potentially kick starting major local regeneration;
- Provision of a new 'gateway' to Huddersfield; and
- Associated junction improvements at Thornton Lodge and Blackmoorfoot Road.

Lockwood Bar

10.61 The Lockwood Bar junction is a key intersection on the A616. The junction routinely operates at a degree of saturation in excess of 100% leading to peak traffic period congestion. The Kirklees Transport model identifies it as one of the districts 'top 20' most congested junctions, with proposed future development in the Colne and Holme Valleys projected to increase demand further. A major remodelling of the junction is proposed to:

The scheme involves:

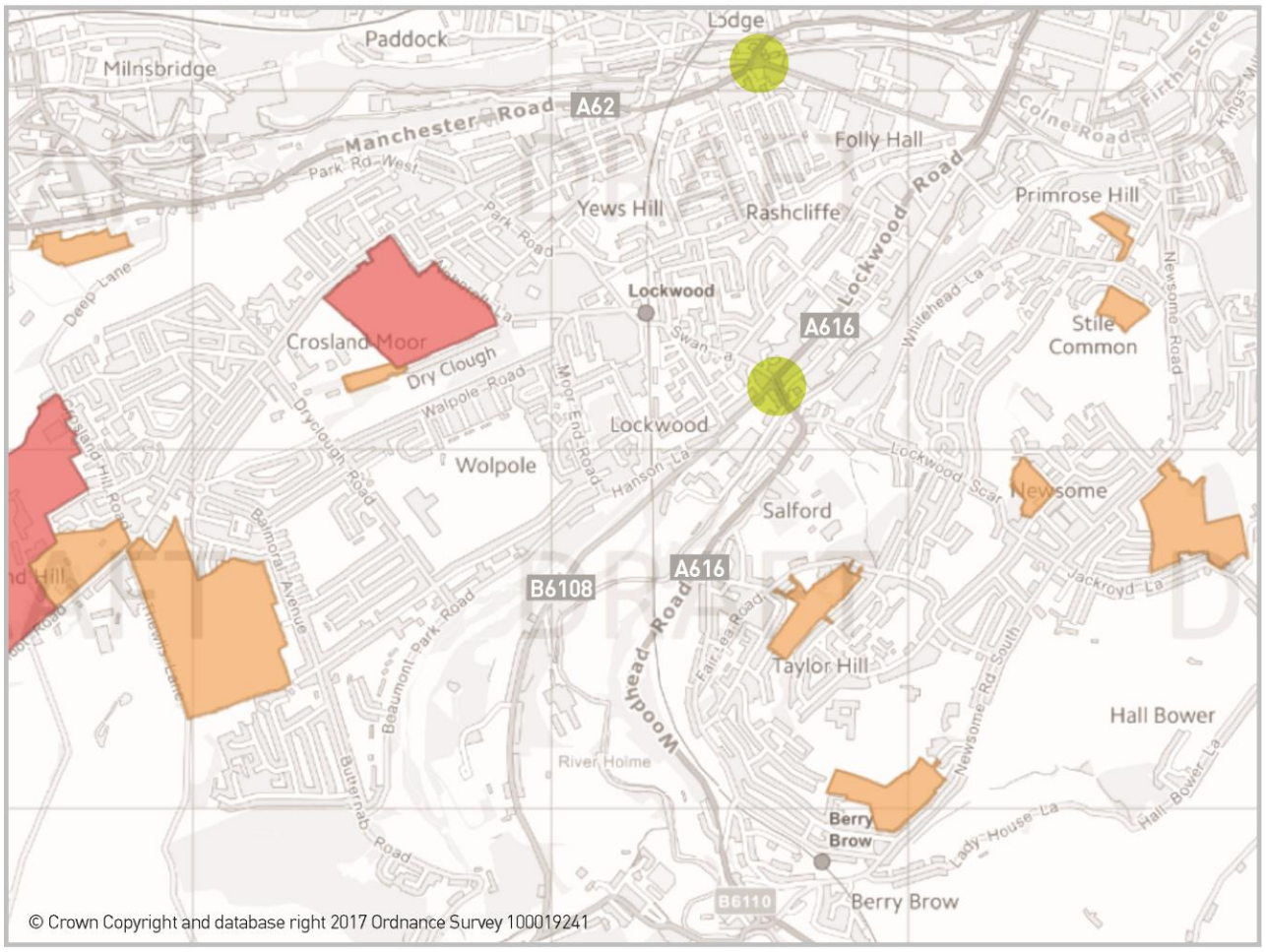
- The creation of a new two-way link between Lockwood Road and Bridge Street using part of Albert Street between Crowther Street and Bridge Street.
- Improvement of vehicular journey times from the Valleys into Huddersfield;
- Better provision for pedestrians and cyclists to improve safety and encourage 'healthy' active travel;
- Creation of a 'gateway' to the town

10.62 The drawing overleaf shows the area of interest for the highway improvement works in relation to local plan allocations (housing, employment and mixed use allocation) in the South Huddersfield Area. Note that this drawing only shows junction improvements as identified through the Council's strategic transport modelling. It is expected that through the planning process, other more localised transport and highway improvements will be pursued if required.

Drawing 8:

Kirklees Local Plan South Kirklees Area allocations - delivery.

Draft Highway Schemes



Key

- Local Plan proposed Housing Allocation
- Local Plan proposed Mixed-use Allocation
- Major Junction/Highway Improvement Works

Capacity Calculations

10.63 As noted earlier a cordon coincident with the geographic area defined in table 5, page 40 was overlaid in the Council's traffic model. The drawing overleaf shows the extent of the cordon.

Drawing 9 South Huddersfield Delay Cordon

10.64 From the cordon, the total number of trips originating, ending and passing through it was calculated as was the total delay in the following scenarios:

The results from this analysis are as follows in the AM:

Table 15

South Huddersfield Area	Cordon Trips	Total Delay (Hr)	Delay per Trip (sec)
Base	5,918	98	60
Do Minimum 2020	7,183	157	79
Do Something 2020	7,345	173	85
Do Minimum 2030	7,666	223	105
Do Something 2030	8,160	227	100

The PM results are:

Table 16

South Huddersfield Area	Cordon Trips	Total Delay (Hr)	Delay per Trip (sec)
Base	6,709	181	97
Do Minimum 2020	7,827	268	123
Do Something 2020	7,953	259	117
Do Minimum 2030	8,279	367	159
Do Something 2030	8,529	390	165

10.65 In the 2030 AM scenario, with no highway or transport improvement schemes in place, cordon trips (within and passing through) increase by 30% when compared with the base. The corresponding delay per trip indicator shows increases of 75% from 60 seconds to 105 seconds. However with the scheme in place (again in 2030), delay per trip drops from 105 seconds to 100 seconds, a decrease of 10%

10.66 The situation in the 2030 PM scenarios is slightly less positive, with cordon trips increasing by 23% between the base and 2030 with no highway improvements schemes in place and by 27% with improvements in place. The corresponding delay per trip indicator shows a 64% increase from 97 seconds to 159 seconds between the base and 2030 with no schemes, but a 69% increase with the scheme in place. This means that the delay actually increases, albeit very slightly with the scheme in place.

10.67 In this cordon it is important to note that the base level of cordon trips is relatively low, as are the levels predicted in 2030. Compare the 2030 figures with those predicted for Coper Bridge and Chidswell. Relatively low figures are also reflected in the average delay per trip in the base (55seconds in the AM and 60 seconds in the PM), therefore any increases of the magnitude noted above will not detrimentally add severely to levels of congestion on the network.

10.68 This cordon contains two arterial routes from South Kirklees to Huddersfield and destinations beyond for vehicles wishing to use the Strategic Road Network (both the M62 AND the M1). Consequently there are many movements both North-South and East-West. In addition the cordon includes traffic originating from a large number of housing and mixed use allocations in Crosland Moor and so it should be expected that further localised investigative work is required to understand if there is potential to reduce average delay per pcu further.

V. Holmfirth

10.69 The Holmfirth highway scheme that is currently under consideration within the Transport Fund can be described as follows:

- The introduction of a substantial traffic management scheme in the centre of Holmfirth.
- Associated capacity improvements at the junction of Victoria Street with Huddersfield Road
- Improved public realm along Victoria Street, Towngate and Hollowgate and associated junction rationalisation.

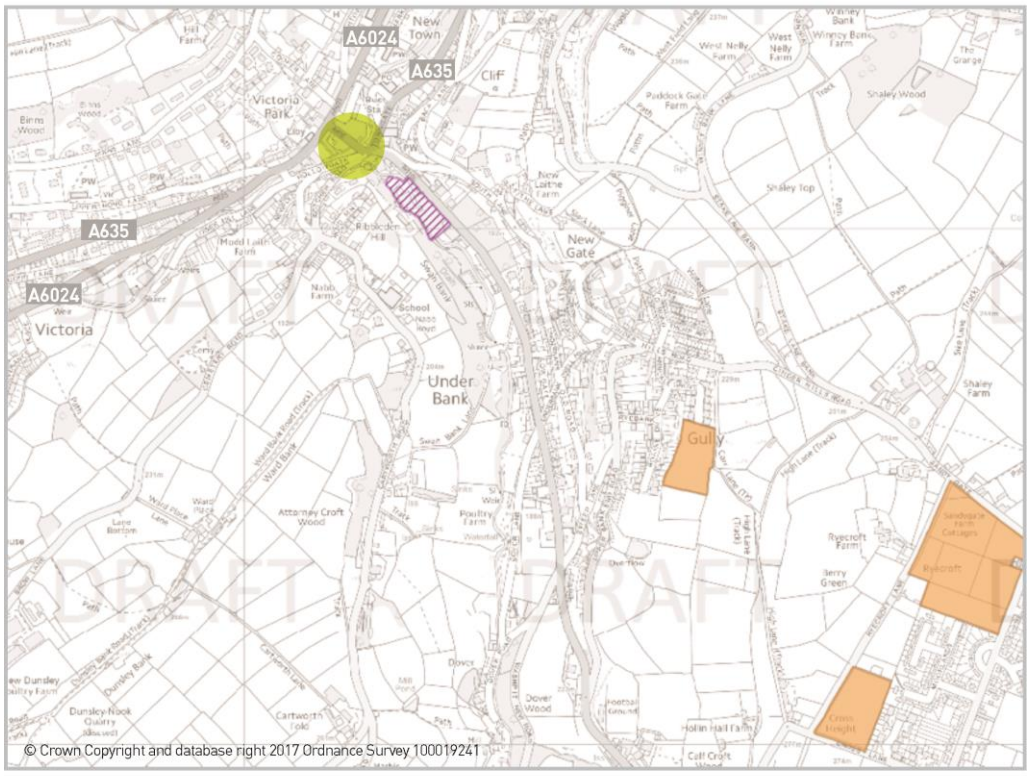
10.70 The drawing overleaf shows the area of interest for the highway improvement works in relation to local plan allocations (housing, employment and mixed use allocation) in the Holmfirth Area. Note that this drawing only shows junction improvements as identified through the Council's strategic transport

modelling. It is expected that through the planning process, other more localised transport and highway improvements will be pursued if required.

Drawing 10:

Kirklees Local Plan Holmfirth Area allocations - delivery

Draft Highway Schemes



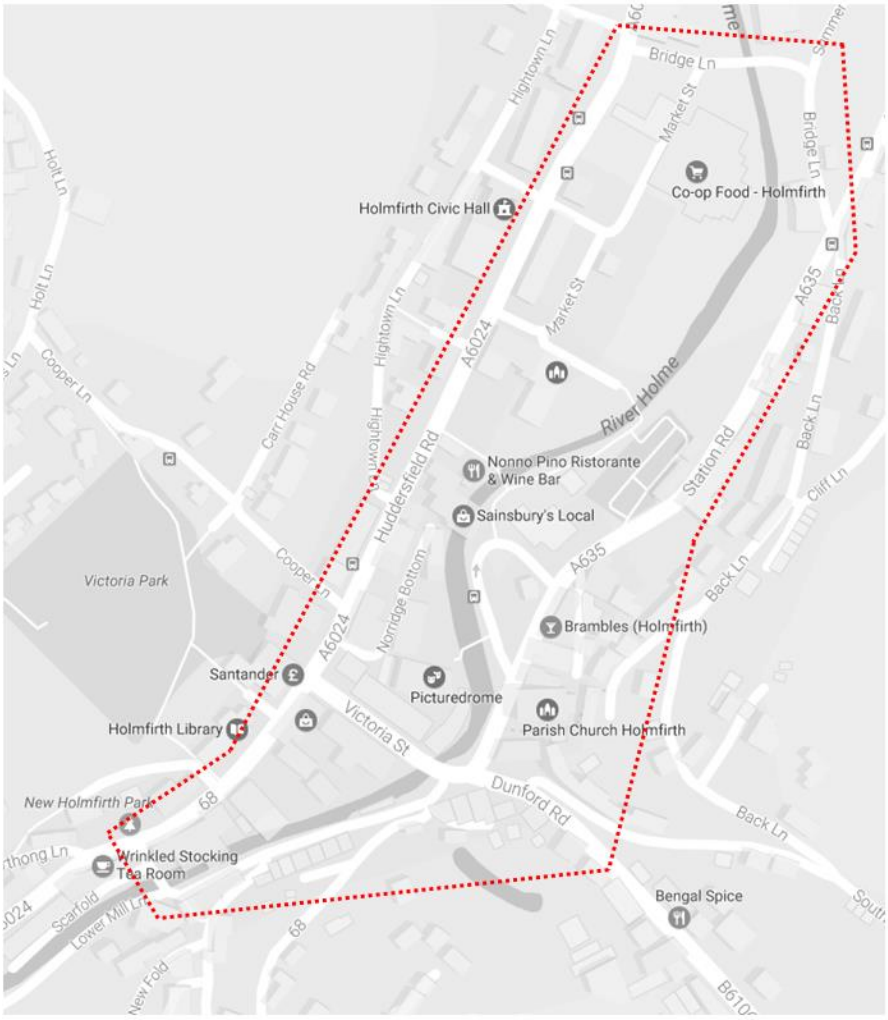
Key

- Local Plan proposed Housing Allocation
- Local Plan Priority Employment Area
- Major Junction/Highway Improvement Works

Capacity Calculations

10.71 As noted earlier a cordon coincident with the geographic area defined in table 5, page 40 was overlaid in the Council's traffic model. The drawing overleaf shows the extent of the cordon.

Drawing 11 Holmfirth Delay Cordon



10.72 From the cordon, the total number of trips originating, ending and passing through it was calculated as was the total delay in the following scenarios:

The results from this analysis are as follows in the AM:

Table 17

Holmfirth Area	Cordon Trips	Total Delay (Hr)	Delay per Trip (sec)
Base	1,388	28	74
Do Minimum 2020	2,269	50	80
Do Something 2020	2,387	28	43
Do Minimum 2030	2,595	67	92
Do Something 2030	2,673	38	51

The PM results are:

Table 18

Holmfirth Area	Cordon Trips	Total Delay (Hr)	Delay per Trip (sec)
Base	1,443	23	57
Do Minimum 2020	2,448	56	82
Do Something 2020	2,625	31	42
Do Minimum 2030	2,738	82	107
Do Something 2030	2,821	51	65

10.73-The scheme for Holmfirth is extremely comprehensive with some relatively far reaching consequences; therefore results should be interpreted with a degree of caution. What should be noted is that there are very low trips passing through and originating in the cordon and whilst this is set to increase in both the 2030 Do Minimum and Do Something scenarios, it is only to a level of approximately 2800.

10.74 The delay per trip in both the AM and PM Do Something 2030, shows substantial reductions when compared against both Do Minimum scenarios. This shows that the identified scheme goes a long way to ensuring that the existing transport network can accommodate the full Local Pan development aspirations over 15 years.

VI. Lepton (Waterloo)

10.75 The Waterloo highway scheme that is currently under consideration within the Transport Fund can be described as follows:

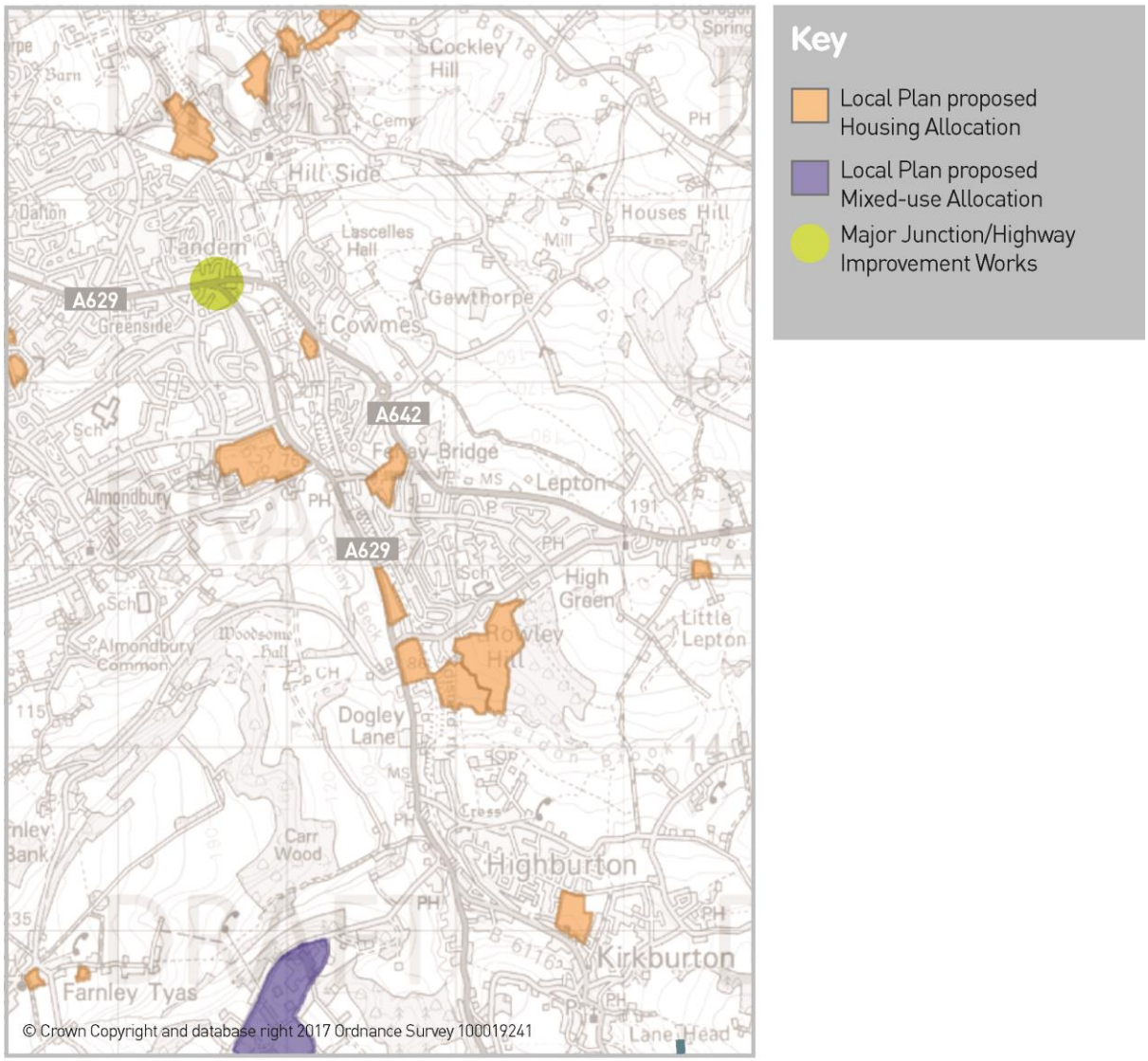
- A simplification of the movements within the junction, still allowing them all to take place, but removing “lost green time” as a result of the simplification and therefore allowing the junction to function more efficiently.

10.76 The following drawing shows the area of interest for the highway improvement works in relation to local plan allocations (housing, employment and mixed use allocation) in the East Huddersfield (Lepton) Area. Note that this drawing only shows junction improvements as identified through the Council’s strategic transport modelling. It is expected that through the planning process, other more localised transport and highway improvements will be pursued if required.

Drawing 12:

Kirklees Local Plan East Huddersfield (Lepton) Area allocations - delivery

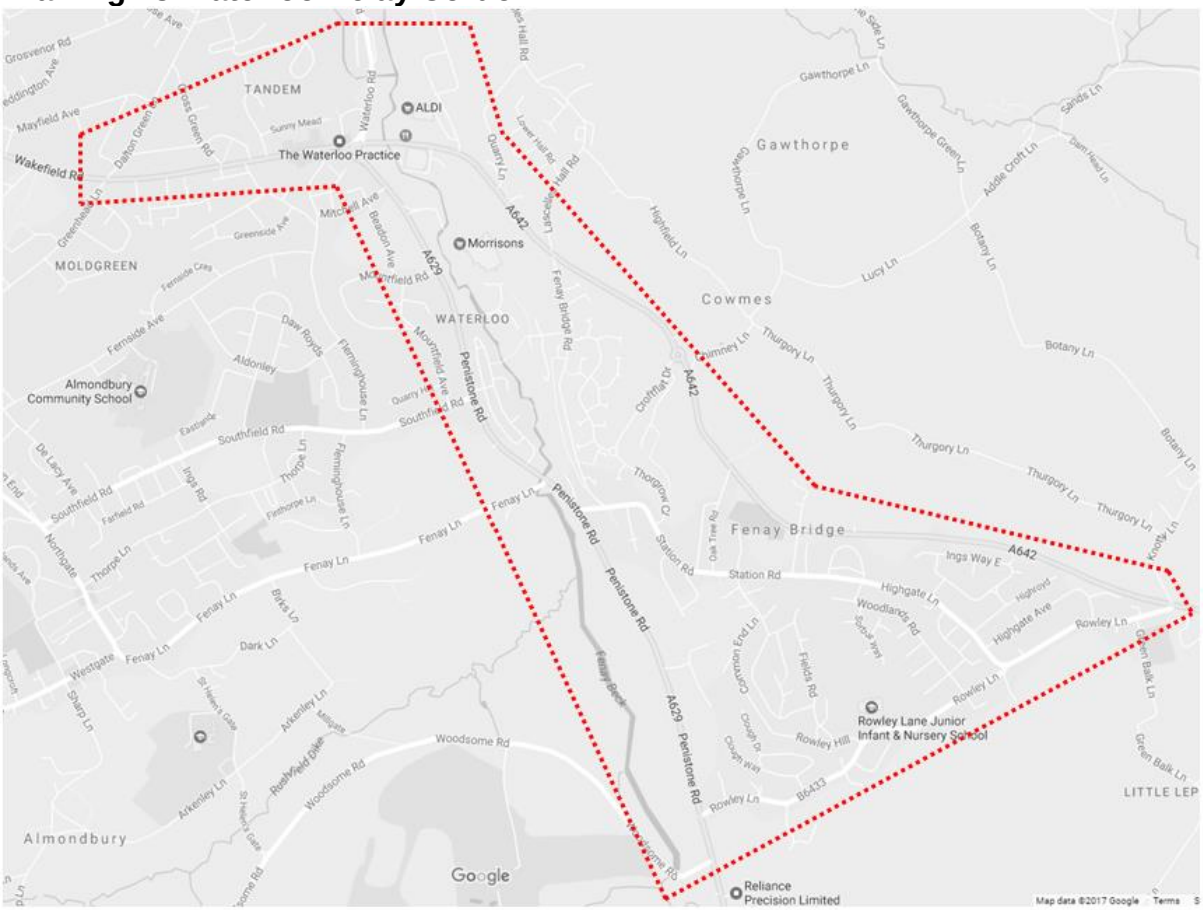
Draft Highway Schemes



Capacity Calculations

10.77 As noted earlier a cordon coincident with the geographic area defined in table 5, page 40 was overlaid in the Council's traffic model. The drawing overleaf shows the extent of the cordon.

Drawing 13 Waterloo Delay Cordon



10.78 From the cordon, the total number of trips originating, ending and passing through it was calculated as was the total delay in the following scenarios:

The results from this analysis are as follows in the AM:

Table 19

Lepton Area	Cordon Trips	Total Delay (Hr)	Delay per Trip (sec)
Base	3,750	50	48
Do Minimum 2020	4,784	70	53
Do Something 2020	4,764	98	74
Do Minimum 2030	5,053	134	96
Do Something 2030	4,921	134	99

The PM results are:

Table 20

Lepton Area	Cordon Trips	Total Delay (Hr)	Delay per Trip (sec)
Base	3,986	59	54
Do Minimum 2020	4,740	99	76
Do Something 2020	4,726	108	82

Do Minimum 2030	4,946	116	85
Do Something 2030	4,919	130	93

10.79 In the 2030 AM scenario, with no highway or transport improvement schemes in place, cordon trips (within and passing through) only increase by 35% when compared with the base. The corresponding delay per trip indicator shows increases of 100% from 48 seconds to 96 seconds. However with the scheme in place (again in 2030), delay per trip drops from 48 seconds to 99 seconds, a increase of 6%

10.80 The situation in the 2030 PM scenarios is slightly less positive, with cordon trips increasing by 24% between the base and 2030 with no highway improvements schemes in place and by 23% with improvements in place. The corresponding delay per trip indicator shows a 58% increase from 54 seconds to 85 seconds between the base and 2030 with no schemes, but a 74% increase with the scheme in place. This means that the delay actually increases, albeit by 8 seconds with the scheme in place

10.81 In this cordon it is important to note that the base level of cordon trips is relatively low, as are the levels predicted in 2030. Compare the 2030 figures with those predicted for Coper Bridge and Chidswell. Relatively low figures are also reflected in the average delay per trip across all scenarios, with the greatest increase of 51 seconds being forecasted between the base and the Do Something 2030 scenario.

10.82 It is the local planning authority's opinion that the levels of delay forecast and the increases forecast over and above the base do not necessarily reflect levels of congestion that could be classed as severe. Further analysis of these figures and interrogation of the traffic model shows that generally more trips being pulled through the junction as a result of the improvements. This is more than likely because there is already a substantial amount of re-routing that already goes on to avoid this junction and through the iterations, the model recognises that travel through this junction now offers a better journey time and as such redirects traffic back through the junction.

10.83 This is a positive story, but to isolate the effects of induced traffic would require the use of a localised junction model without the capacity to reassign and where growth is input manually. This is work the local highway authority will be undertaking in the next month and will update this technical addendum accordingly.

10.84 Notwithstanding the above and as already noted the levels of delay at this junction are not considered severe and therefore it is postulated that the junction improvements can accommodate the proposed local plan growth in the area defined in drawing 12.

Conclusion

10.82 The purpose of this addendum to the Transport Technical Paper was to clarify some of the issues around deliverability of the major transport schemes contained within the body of the paper. The addendum has set out to address the following points from a funding and practical feasibility point of view:

Under funding feasibility, the following points were addressed:

- How is the scheme going to be funded?
- Is the funding likely to be secured? What information do we have that can help show that?
- Is the fundi ng likely to be in place within the plan period?
- What is the process for securing funding?

Under practical feasibility the following points were addressed:

- What is the scheme?
- Where the scheme is suitably developed, can it delivered from an engineering perspective?
- Does the likely design give adequate capacity to support the plans proposed allocations?

10.83 With respect to the last bullet point, further information was provided in terms of the ability of the modelled schemes at a more local level to provide an adequate level of mitigation of the highway impacts of the local plan allocations in pre-defined geographical cordons.

10.84 The cordons took into account not only traffic originating and terminating within the cordon, but also that passing through the cordon, either from other allocations in the district that would use it as part of a trip[6] or from traffic that has rerouted as a result of capacity increases making their existing journey quicker[7]. Similarly the model has been run with all proposed transport schemes in it, which in themselves will lead to traffic in the model rerouting between D Minimum and Do Something scenarios

10.85 As a result of these above factors it is difficult to separate the ability of a specific scheme to accommodate solely the traffic growth associated with the local plan, either in a cordon or as a result local pan development

10.86 It is of course not the role of the local plan to solve existing congestion problems, but what is clear is that in the majority of cordons we see specific decreases in terms of delay per trip from the Do Minimum scenario and the Do Something scenario, whilst cordon trips increase. This which shows that when the schemes are implemented there is benefit from the schemes and almost as importantly that the network is becoming more efficient, i.e. for either decreases in delay or in isolated cases minimal increases, the transport

[6] Induced traffic
[7] Redirected traffic

schemes have the ability to cope with increasing levels of traffic associated with the Local Plan development.